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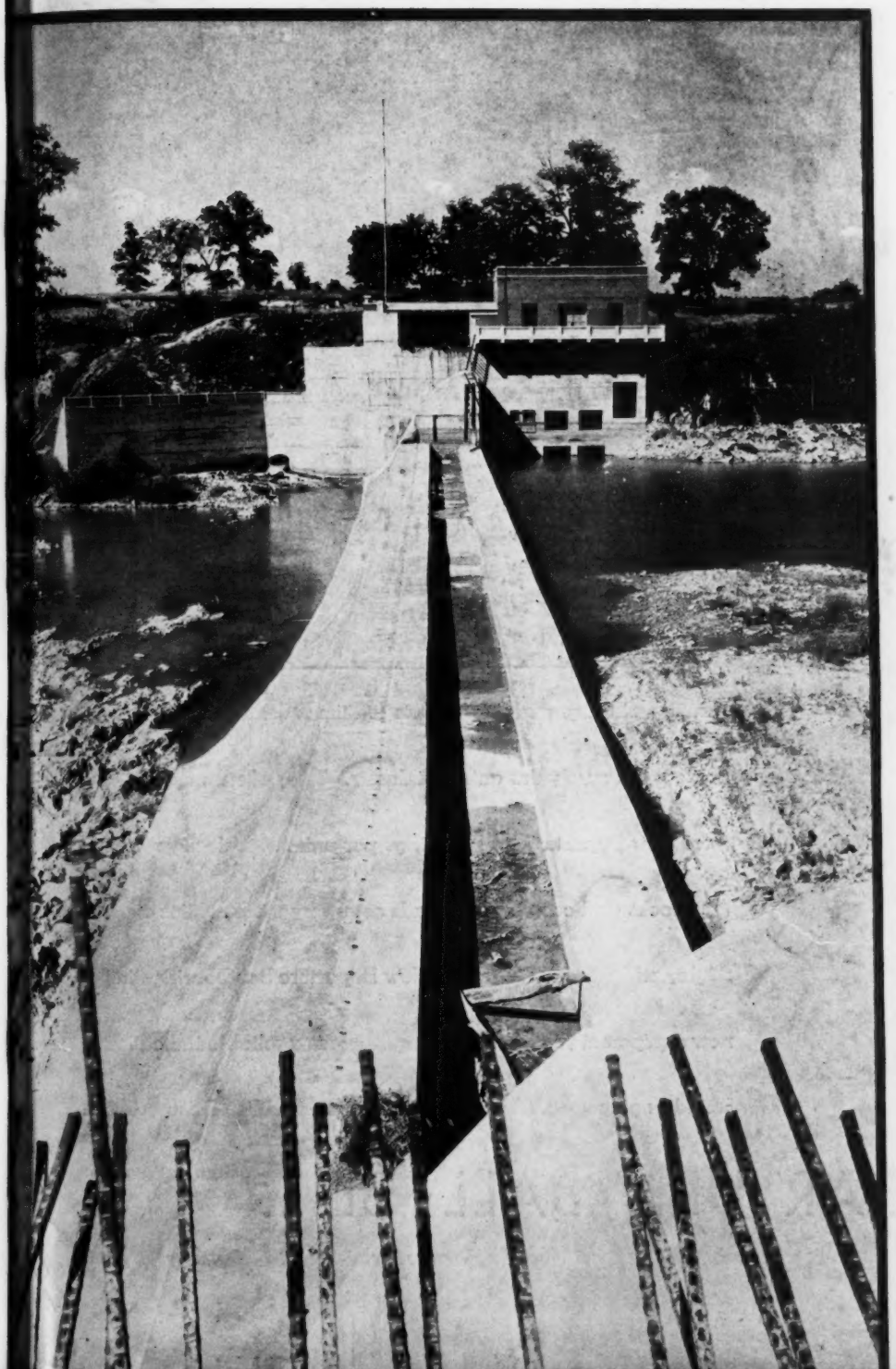

## Advances in Waterworks Practice

Reading Starts Work On New Supply

A New Filter Plant For Conneaut

The Mahoning Valley Pumping Station

Recent Advances in Waterworks Design Practice

Recording the Condition Of Fire Hydrants

Water Supply Engineering For Golf Courses

Armour Institute's Experimental Purification Plant

Abstract of Report on Nation's Water Resources

Concrete spillway of Ontelaunee dam, which is to be raised as part of Reading's waterworks improvement program

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## NEW DEPARTURE BALL BEARINGS

# To Maintain *Waterworks* Development

TIMES such as these compel men and nations alike to take stock of prospects. They must determine whether they can continue along their accustomed lines or whether they must revise them or strike out on wholly new lines. All this is equally true of industries and industrial units.

Some industries, from their nature, must undergo radical change. Others are so geared to fundamental needs that they may be certain of a continued place in the national economy. But this does not mean that they dare sit complacently by to await the inevitable comeback of interrupted demand. However essential any commodity or service may be, it must under present conditions be sold and resold to those who need it.

This does not imply ballyhoo or high-pressure; it does not contemplate forcing unneeded surplus production upon sated and reluctant users. It does mean the maintenance of sound and healthy demand based upon a clear understanding of value and utility; it means the overcoming of the inertia that has resulted from fear, uncertainty and financial paralysis.

It means the reawakening of those who need a service to a recognition that, by depriving themselves of it, they must lose more than they can save.

In this category of essential industry falls the provision of adequate water supplies to our communities. No function is more basic; no service more vital. No industry should enjoy a more consistent demand for its services, provided only that the community see clearly how little it can afford to dally with inadequate or unsafe supplies.

Added point is given to this comment by two current developments. One is the drought, which has brought home so strikingly to many communities the urgent need to overhaul their present supplies and to insure against disastrous shortage under another such visitation.

The other is the establishment by the federal government of the National Resources Board, charged among other responsibilities with that of preparing a basis for drafting national policies with respect to the development, use and protection of water resources.

Emphasis must be laid on the term "national policies." For in this case, as in others, the establishment of a national policy with respect to a public or economic activity should not be expected to supplant the exercise of adequate individual, industry or community initiative. Much of the current complaint of government interference comes from those whose own inertia has forced governmental activity beyond the realm of guidance or cooperation into that of "interference" or "usurpation."

So whatever may be accomplished by the National Resources Board with respect to public water supplies will be of slight immediate or practical value without the active interest of engineers, waterworks officials and the industry in general. All these are in position to make its studies more accurate and comprehensive.

Moreover, the essential complement to any study of resources is a study of needs, to the end that potentials may be converted most effectively into realities.

The industry groups alone are in position to assist in sound estimates of need and to stimulate local and regional interest in the wise and economical development of resources. Policies may be national in their scope but, to be effective and practical, planning must be regional or local.

A few years ago the waterworks industry, through its organized groups, did an outstanding job in developing manuals of technical practice. More recently it has contributed mightily to a broader understanding and application of the PWA project as it affected waterworks. Is it not in order for the industry now to cooperate with equal effectiveness in the work of the National Resources Board?

Such an organized effort to stimulate community interest in waterworks needs and resources might go far to strengthen the hands of public officials in charge of water supply; it might help to maintain during the period just ahead of us a reasonable demand for the services of many engineers, contractors, manufacturers and of the thousands of workers whose employment is dependent upon sound and normal progress in the development of waterworks facilities.

Willard Chevalier

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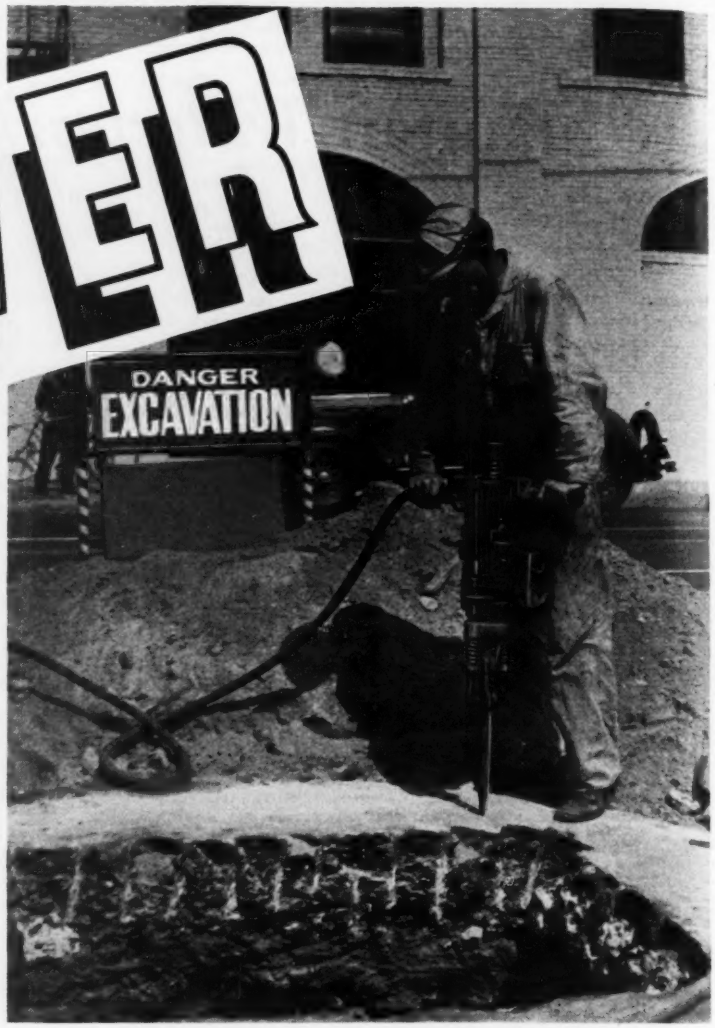


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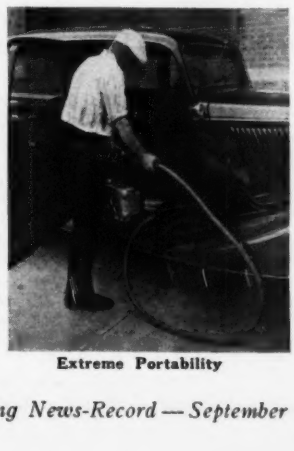

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## In the News:

THE FEDERAL LOW-COST HOUSING PROGRAM will advance another full-size step when court action will be instituted within the week to clear up title to the site for a $3,000,000 housing project in Indianapolis. Ninety per cent of the area is already under option, the layout for the development has been determined, and preliminary plans have been drawn.

A CHIEF ENGINEER for the Los Angeles County Flood Control District will be appointed after Sept. 18 by the board of supervisors from a list of ten names submitted by the Am.Soc.C.E., to fill the important position occupied by E. C. Eaton for seven years until his resignation last week.

ANOTHER HALF-MILLION of the public-works funds which will never build public works has just been allotted by Administrator Ickes: $250,000 for the 1935 expenses of the special foreign trade advisor and $316,000 for administration expense of the AAA.

HIGH EASTERLY WINDS coming at a time when water in the St. Lawrence is abnormally low stopped all traffic through the canals between Lake Ontario and tidewater at Montreal on Sept. 8 and resulted in the grounding of several ships held in the river at Morrisburg, Ont., waiting to get into the canal. The depth of water over the sill of the Galop locks was down to 11ft. 8in. from a normal of 14 ft.

DECISION to reorganize and strengthen the Construction League of the United States has resulted in the appointment of a committee to study the problem, headed by Robert D. Kohn.

DORMANT for thirty years, the application of the federal government for water rights on the North Platte River for the Casper Canal, on the Casper-Alcova project, will be aired at a public hearing before the Wyoming state engineer.

## In This Issue:

BECAUSE of numerous inadequacies of the old water-supply system, notably the inability of the slow sand filters to handle the occasional high turbidities, Reading, Pa., is engaged in the construction of an entirely new supply works. The new system includes an earth dam and concrete spillway on Maiden Creek, a concrete conduit for raw water, and a purification plant. The old slow sand filters are to be remodeled to serve as a filtered-water reservoir. Storage on the distribution system is also to be improved.

CONNEAUT, OHIO, has installed a modern rapid sand filter plant and abandoned its old system, now obsolete. The situation pointed to economy in abandonment rather than an attempt to repair and modernize the existing plant. The new installation includes a new intake crib, a rapid sand filter plant, an elevated tank and new feeder mains. The project has been financed by the RFC.

DESIGN of the new pumping station for the Mahoning Valley Sanitary District, serving the cities of Youngstown and Niles, Ohio, is described by G. Gale Dixon. This is the third article discussing the district's new water-supply system. The pumping station includes both low- and high-lift units. All are electrically driven. The design of the plant allows raw water to flow to the filtration plant by gravity when the level of the water in the reservoir is high enough, the low-lift pumps being put into service only at times of low reservoir level.

THE ADVANCES that have been made in waterworks design practice during recent years are given discussion in a symposium by five well-known consulting sanitary engineers. They describe how the recent additions to knowledge of water science and the developments in waterworks materials and equipment are being utilized for the betterment of water service.

FIRE-HYDRANT INSPECTION should be the responsibility of the water department rather than the fire department, according to Carl A. Hechmer, of the Washington Suburban Sanitary District. Mr. Hechmer describes the method adopted by his organization to record the results of systematic inspection.

THE FUNDAMENTAL CONSIDERATIONS in the problem of supplying water for golf courses are set forth by Paul E. Green and George L. Opper. The sprinkling of tees and greens does not make a heavy demand for water, but fairway irrigation constitutes a problem of major magnitude.

AN EXPERIMENTAL water-purification plant of great flexibility has been installed at Armour Institute of Technology. It will allow research on all the widely used purification processes. Chicago city water serves as the plant's basic raw-water supply, but it can be modified by the addition of foreign substances.

## Coming Articles:

COMMENT on the problems involved in the development of a national water policy are discussed by Carey H. Brown, former chairman of the board of review of the Public Works Administration, in an article to be published in the near future.

WHERE modern motor cars are made, modern construction may be expected. Here in the Administration Building of the Chrysler Sales Corporation in Detroit, a building shining with stainless steel and glass, the floors meet that expectation. Built of fine terrazzo made with Atlas White portland cement, they carry out in precise pattern and cheerful colors the decorative scheme. With *white* portland cement terrazzo, *any* colors for *any* design are simply and surely secured. The white cement matrix may be colored to blend evenly with the natural colors of the marble chips, as in the floor below, or colored to contrast brilliantly with the chips, according to the floor's individual design. Some suggestions of the adaptability and beauty of fine terrazzo may be seen in our catalog in Sweet's. Any terrazzo contractor will furnish specific details. Or write Universal Atlas Cement Co., *Subsidiary of United States Steel Corporation*, 208 So. La Salle St., Chicago.

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September 13, 1934

FIG. 1—CONSTRUCTING a half-mile earth dam to provide storage of four billion gallons of water. Earth-fill is dumped from trucks in piles as shown and is later spread and rolled in layers 6 to 8 in. A team of horses with a slip scraper transports rock for protection of the upstream face.

# Reading Starts Work on New Water Supply System

**Because of inadequacies of the present supply works a complete new water plant is being built, including an impounding dam and reservoir on Maiden Creek, conduits and a purification plant—Storage provision on the distribution system is also to be improved**

AWARD of six construction contracts during the past few months has carried into active execution a comprehensive program of improvement to the water-supply system of Reading, Pa. Owing to numerous inadequacies of the existing supply works, a general improvement program has been in the making for more than ten years. A recent allotment to the city by the Public Works Administration of a loan and grant of $2,550,000 has made possible the translation of the plans into an active program of construction.

Briefly, the general development program includes a large impounding reservoir on Maiden Creek; a pressure conduit from the reservoir to a new filtration plant; a filtration plant of the rapid sand type, having an ultimate capacity of 40 m.g.d.; a 60-in. filtered-water conduit connecting the new filter plant with a filtered water reservoir; the remodeling of existing slow sand filters for use for the storage of filtered water; and the reconstruction of the Hampden Reservoir in the city.

The original development of Maiden Creek as a source of water supply dates back to 1889, when Reading began the construction of a boiler house and steam-pumping station on the east bank of the creek a short distance above the Schuylkill River. This plant delivered raw water into the city through a main about 4½ miles long.

In 1908 the city started construction of the present supply works. These comprise the Glen Gery Dam on Maiden Creek, a low concrete structure 2 miles above the creek mouth; a concrete raw-water conduit 60 in. in diameter and about 9,000 ft. long; a filter plant on the east bank of the creek, and a cast-iron filtered-water conduit leading to the suction wells at the pumping station. The filters are of the covered slow sand type, ten in number, and have a total nominal filtering capacity of 12 m.g.d. These works were placed in service in 1913, and since that time have constituted the main source of the municipal water supply.

No provisions were made in the Glen

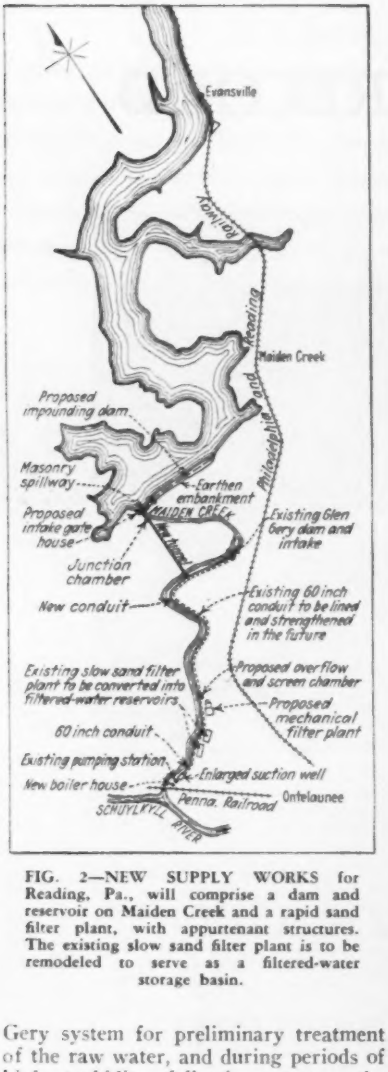



**FIG. 2—NEW SUPPLY WORKS for Reading, Pa., will comprise a dam and reservoir on Maiden Creek and a rapid sand filter plant, with appurtenant structures. The existing slow sand filter plant is to be remodeled to serve as a filtered-water storage basin.**

Gery system for preliminary treatment of the raw water, and during periods of high turbidity following storms the filters quickly clogged. At times they became so completely choked that it became necessary to deliver unfiltered water to the city.

Faced by these difficulties in filter operation and a threatened water shortage due to rapidly increasing consumption, the Bureau of Water in 1920 undertook extensive studies for comprehensive improvement and extension of the supply system. Reports of the water engineer in 1923 and 1926, based on extensive study and investigation, formed the groundwork upon which the present general development program rests.

At the present time water is supplied by the municipal system to a total population of about 120,000, of which some 7,000 are outside the city. It has been estimated that by 1950 the total population served will be between 160,000 and 175,000, and that the average demand for water will be between 18 and 20 m.g.d.

During the past nine years the city has taken title to the greater portion of the property required for the Ontelaunee Reservoir, the proposed new reservoir on Maiden Creek, ¾ mile upstream from the existing Glen Gery intake. The area has been largely cleared of trees, and much replanting has been done on vacant land around the reservoir. A gatehouse and the lower portion of the concrete masonry section of the new dam have been constructed. Excavation has been completed for the filter plant, and a portion of the filter equipment has been purchased. Also improvements have been made at the pumping station, and the filtered-water conduit from the old filter plant to the pumping station, together with a new pump suction well, have been constructed.

These improvements have been largely financed from water revenues, and the costs can be summarized as follows:

| | | |
|---|---|---|
| (1) Ontelaunee Reservoir | | $1,897,000 |
| (2) Filtered-water conduit and suction well | | 25,000 |
| (3) Filtration plant | | |
| Excavation | $55,000 | |
| Equipment | 30,000 | 85,000 |
| (4) Pumping station and boiler house | | 461,000 |
| | | $2,468,000 |

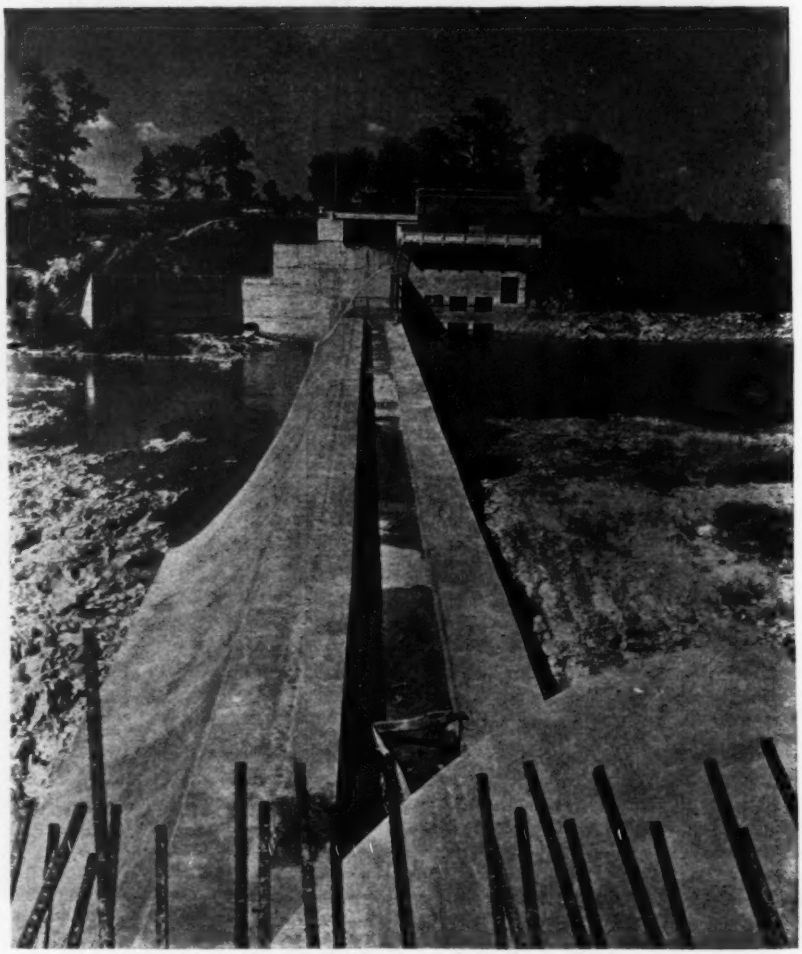
On Nov. 7, 1933, a bond issue was approved by the voters of Reading to complete the improvement program. The Public Works Administration made an allotment of $2,550,000, comprising a loan and grant. The first construction contract, for completing Ontelaunee Dam to its designed height, was let on March 29, 1934.

### Ontelaunee Dam and Reservoir

The dam now under construction is an earth structure 2,400 ft. long, faced with riprap on the upstream slope. A short length of concrete corewall has been provided at the western end. The remainder of the dam's length will be provided with a concrete mat, with cutoff wall, on top of the rock.

Of the 192 square miles of drainage area tributary to Maiden Creek above Ontelaunee Dam, the northern 149 square miles comprises country underlain by shale, while the southern 43 square miles, including the site of the reservoir, is in limestone formation. It is known that certain crevices and caverns exist within the limits of the reservoir, but the general character of the formation and the presence of the

**FIG. 3—THE CONCRETE SPILLWAY of the new Ontelaunee Dam is to be completed to its full height. The spillway will have a total length of 543 ft. and will be surmounted by a series of concrete arches carrying a roadway.**



heavy blanket of clay over the limestone at the lower end of the basin has led to the opinion that serious loss of water is not to be expected.

Good material for the construction of a rolled-earth dam is to be found downstream along the creek bank. A large part of the existing spoil bank on the east side of the creek is suitable for use, particularly the rock, which can be incorporated in the riprap.

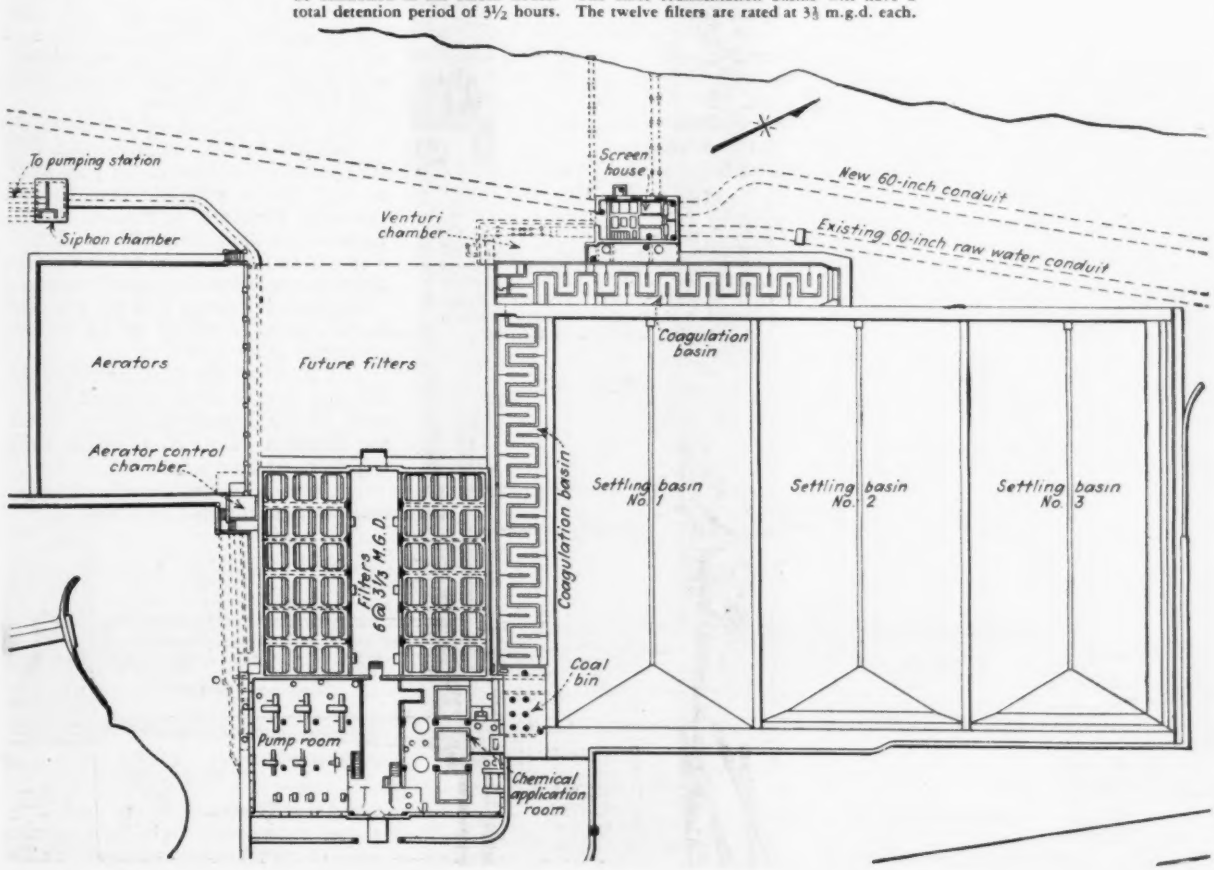
At the western end of the dam a concrete spillway 543½ ft. long, abutment to abutment, will be provided, carrying a highway bridge. It has been designed to pass 41,000 sec.-ft. through openings between piers aggregating 504 ft. in length.

At the west end of this proposed spillway a gatehouse has already been constructed. From it three concrete conduits will lead the water to a junction chamber near by on the creek bank. From this junction chamber the water will be conveyed to the new filtration plant, about 1½ miles downstream. For most of its length the new conduit will follow the windings of Maiden Creek, paralleling an existing conduit from the Glen Gery Dam, but for the first 2,500 ft. of its length it will consist of a concrete tunnel driven through high ground to cut off a wide bend in the creek. The new conduit will be 60 in. in diameter and will have a capacity of 40 m.g.d. It is believed that this capacity will be adequate for the needs of the system for more than 30 years.

The existing conduit, also 60 in. in diameter, was built more than 20 years ago for conveying water from the Glen Gery intake to the slow sand filter plant. To enable it to operate safely under the higher pressures that will be oc-

**FIG. 4—CONCRETE COREWALL** of the Ontelaunee earth dam follows the contour of sound rock. The corewall consists of a concrete slab surmounted by a low wall of varying top profile. Seams in the rock under the slab are grouted. The trench in which the bottom slab is constructed is backfilled to the top of the wall with selected materials.

**FIG. 5—LAYOUT** of purification plant. Flow of raw water from reservoir will be controlled at the screen house. The three sedimentation basins will have a total detention period of 3½ hours. The twelve filters are rated at 3⅓ m.g.d. each.



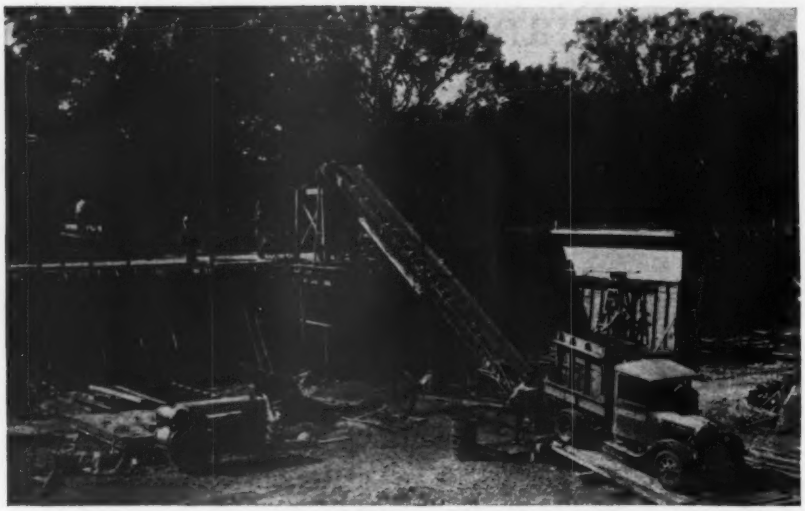


**FIG. 6—EFFICIENT DISTRIBUTION** of concrete in the building of Reading's new filter plant includes truck delivery of mixed concrete to an elevating belt conveyor, with final placement by buggies.

casioned by the elevation of water in Ontelaunee Reservoir, it will be lined and strengthened when the demand exceeds the capacity of the new conduit. Connections are to be provided so that both conduits will be available for use to carry Ontelaunee water to the new filtration plant.

### Purification plant

The new purification plant comprises a screen chamber, provided with two traveling screens, of which one will be installed at this time, a venturi meter chamber, a headhouse in which there will be housed chemicals and chemical feeding equipment, a coagulation basin of the labyrinth type, three sedimentation basins, twelve rapid sand filters and an aeration basin.

The screen house will also serve as a control chamber. The raw water will stand in an open well, and its level can be adjusted by manipulation of gate valves at the end of the conduit. Excess flow will be discharged into an overflow well and will be led through a 42-in. line to the creek.

The screen will be motor driven, and the screenings will be discharged into a trash trough and sluiced away to the creek.

The screened water will flow through a venturi meter and thence to the headhouse to receive the dose of coagulant. After being dosed, it will be led to the coagulation basin, a labyrinth-type structure shaped like an L, to be built around one corner of the sedimentation basin.

The three sedimentation basins will provide a settling period of 3½ hours at the ultimate rate of operation of the plant. They are to be rectangular in plan, and the flow will be directly across from one end to the other, with no baffles being used. To obtain even distribution of flow across the width of the basin, inlets and outlets will be through a number of perforated brick panels built into the end walls of the basin.

Twelve filters are to be provided, each having a rated capacity of 3½ m.g.d., six on each side of a central gallery. Each filter will be 41⅝ ft. long and 32¼ ft. wide, and will be divided into halves by a central gutter. Settled water to be applied to the filters will enter through this gutter, and the gutter will also receive the spent washwater and conduct it to the washwater drain.

Following filtration, the water will be pumped to the aeration basin, which will contain 110 circular dripping-tray aerators.

Aerated water will be led to the filtered-water storage reservoir, to be formed by remodeling the existing slow sand filters.

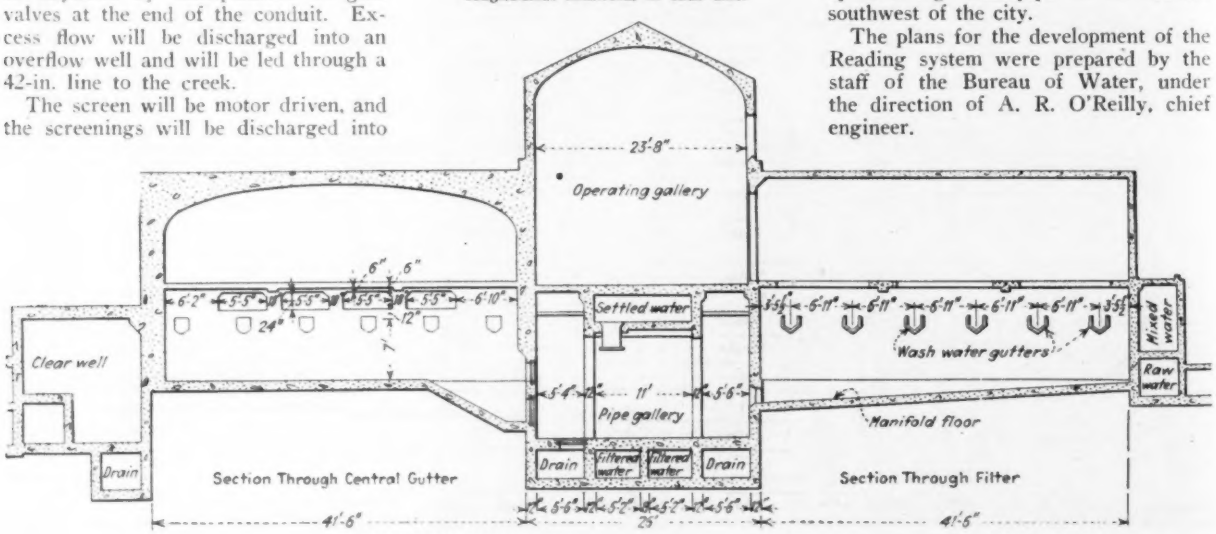
The principal storage of filtered water within the city limits is now provided by Hampden Reservoir, situated in the eastern part of the city about 1½ miles northeast of the center of the high-value business district. This reservoir is an open basin holding 29 m.g. and having a depth of 27 ft. It is formed partly in excavation and partly by embankment, with a clay puddle used to form the core of the embankment and as a blanket on the bottom and on the interior slopes. It has been in service for 50 years, and on a number of occasions has caused serious concern by the sliding of the embankment and by the development of sink-holes and leaks in the bottom.

The reconstruction of this reservoir is included in the comprehensive plan for system improvement, the plan being to construct a complete new covered reservoir structure of reinforced concrete within the existing basin. Provision will be made for the use of the area above the roof for playground purposes.

Additional storage will be provided by a 2-m.g. standpipe to be erected southwest of the city.

The plans for the development of the Reading system were prepared by the staff of the Bureau of Water, under the direction of A. R. O'Reilly, chief engineer.

**FIG. 7—CROSS-SECTION** through the filter plant. Each filter will be constructed with a central gutter, which will serve to admit the settled water and to receive the spent washwater. The underdrain system will consist of laterals connecting with two longitudinal manifolds in each unit.



# Modern Waterworks Plant Replaces Obsolete System

## Conneaut, Ohio, builds entire new supply system, abandoning unsafe intake, poorly functioning filter plant, and inefficient steam pumping plant

By William L. Havens
*Consulting Engineer, George B. Gascoigne & Associates, Cleveland, Ohio*

THE FORMAL dedication on June 1, 1934, of the new water-supply improvements at Conneaut, Ohio, marked the culmination of several years' effort on the part of city officials to replace an obsolete and inefficient plant with one of adequate capacity and modern design. The new installation includes an intake, a low-lift pumping plant, a purification plant, a high-lift pumping plant, an elevated tank and feeder mains connecting with the distribution system. The project was one of the first to be approved by the Reconstruction Finance Corporation as a self-liquidating project.

The old water-supply system at Conneaut was installed in 1890, passed into the hands of the Conneaut Water Company in 1901 and was subsequently purchased by the city in 1921. At that time, based upon an appraised valuation of $400,000, six per cent bonds were issued with provision for retirement of the entire issue in 1941. In 1931 additional bonds were issued by the city in the amount of $75,000 for waterworks improvements, and the proceeds from this bond issue remained available in 1933 for new construction work. Since the purchase of the old plant in 1921, there has been transferred to the sinking fund from operating revenues about one-half the original bond issue.

The original plant was located along the lakefront near the mouth of Conneaut Creek and obtained its raw water supply from an intake and timber crib located inside the breakwater, and therefore subject to the pollution of the creek and inner harbor. The main features of the plant, together with their age and condition, are shown in Table I.

It is quite obvious from this summary that the old plant was in many ways inadequate and inefficient. Aside from possible failures that might occur from time to time, storage was insufficient both at the plant and in the distribution system. From a treatment standpoint, the main difficulties included a highly polluted raw water, insufficient sedimentation and inadequate provision for properly washing the filters. Also, the mechanical equipment at the pumping station was uneconomical and badly in need of repair or replacement. Operating difficulties were frequently experienced because of sand deposits around the submerged crib or because of clogging of the crib and intake with ice during the winter months.

Since the purchase of the plant by the city in 1921, thought had been given to the possibility of remodeling and repairing the existing structures, but within recent years the relative economy of building an entire new plant became evident. Previous repairs indicated that the construction cost would be only slightly greater than that of making the necessary repairs to the old plant. Besides, a new plant at another location would afford a much better quality of raw water.

### Financing new plant

This proposal, however, met considerable opposition, partly because it was believed that the old plant could be economically remodeled and repaired and partly because of financial conditions and the fact that bonds issued for the old plant would not be retired until 1941. However, late in 1932 a waterworks commission was organized in Conneaut, and it was authorized to proceed with the construction of a new filtration plant and intake. At this time also an application was made to the federal government for assistance in financing the construction of the plant as a self-liquidating project under the RFC. The plan proposed would allow for repayment of interest and principal on the new bonds from operating revenues of the plant, and thus would not increase the tax burden of the city. Accordingly, the financial and engineering data were assembled and submitted to the RFC. Early in 1933 the city received approval of its application and was told that the money would be loaned

TABLE I—OLD WATERWORKS SYSTEM AT CONNEAUT, OHIO

| Item | Date of Installation | Description | Condition as of January 1, 1933 |
|---|---|---|---|
| Distribution system | 1890 to present | Mainly cast-iron pipe. | Fairly well gated. Several mains of inadequate size. Single feeder main from plant. |
| Intake and crib | 1905 | Crib originally placed on rock bottom. | Sand deposits in inner harbor had resulted in shallow water depth above intake. |
| Intake and crib | 1921 | 16-in. suction and 60-in. tunnel, terminating in 5-ft.-diam. brick well from which extended suction line to low-service pumps. | Considerable trouble experienced from sand deposits at crib and with ice during winter months. |
| Filtration plant | 1900 | 2 wood tub filters, 0.5-m.g.d. capacity each. | Strainers loose in laterals. Control equipment inoperative. |
| Filtration plant | 1904 | 1 wood tub filter, 0.5-m.g.d. | |
| Filtration plant | 1912 | 3 concrete filters, 0.5-m.g.d. each. | Control equipment inoperative. Washwater rate too low for efficient operation. |
| Sedimentation basins | 1907 | 2 circular wood tanks. Total cap. 160,000 gal. | Settling period too short for properly conditioning water for filtration. |
| Clear wells | 1900<br>1912 | Total cap. less than 60,000 gal. | Inadequate storage, especially considering operation of washwater pump. |
| Low-service pumping equipment | 1918 | Steam, reciprocating (3.3-m.g.d.). | Non-condensing. |
| Low-service pumping equipment | | Single-stage steam-turbine-driven centrifugal (2.8-m.g.d.). | Stand-by unit. |
| High-service pumping equipment | 1900 | Cross-compound, duplex, crank and flywheel, 2.5 m.g.d | Minor repairs would have placed this pump in fair condition. |
| High-service pumping equipment | 1918 | Direct acting, 2.5-m.g.d. | Not adapted to direct pumping conditions. |
| Boilers | 1912<br>1922 | 175-hp. horizontal return tubular. | Hand-fired. Stack in poor condition. |
| Standpipe | 1890 | 20-ft.-diam., 120 ft. high, 280,000-gal. capacity. | Inadequate storage. |

FIG. 1—FOUR RAPID SAND FILTERS are provided, each filter being 16x16½ ft. in plan and rated at 0.75 m.g.d.

by the government at an interest rate of 5 per cent, both interest and principal to be repaid from operating revenues of the plant. Contract drawings and specifications were prepared, and bids for the construction work were received on May 20, 1933.

## The new plant

The new plant was designed to serve a future population of 15,000 at a maximum daily rate of 200 gal. per capita. The 1930 population of the city was 9,691. Including the water supplied to East Conneaut, it was estimated that the total number of persons served by the distribution system was about 10,500. It is rather interesting to note that of the total average daily consumption about 55 per cent is used by railroads and industries.

The construction was divided into three major contracts, one for the submerged crib and intake, another for the filtration plant, and the third for a 500,000-gal. elevated tank. Plans were also prepared for a 16-in. and 12-in. force main leading from the new plant to connect with the existing distribution system. This work, however, was not advertised as a public contract but was installed as force-account work under the supervision of the water superintendent, so that about $10,000 in delinquent water bills could be worked out.

The main features of the new plant are shown in Table II.

There are no particularly unusual features in connection with the filtration-plant design. The filters themselves are of the customary type and are provided with underdrains of perforated pipe. Each of these units is 16x16½ ft. in plan, and a rate of wash corresponding to a minimum vertical rise of 24 in. per minute has been provided. A venturi meter has been installed in the high-service-pump discharge line to measure the total water pumped to the distribution system, and individual meters have also been provided to measure the water used for washing the filters and for other purposes about the plant. The high-service pumps are automatically controlled by the elevation of water in the elevated tank. The liquid chlorine equipment as well as a portion of the laboratory equipment was salvaged from the old plant, but otherwise all of the new plant was constructed from new material.

The entire plant has been so laid out that it can be economically enlarged to double its present capacity upon the present site. This applies not only to the space allowed for future pumping units but also to existing pipe lines and conduit connections.

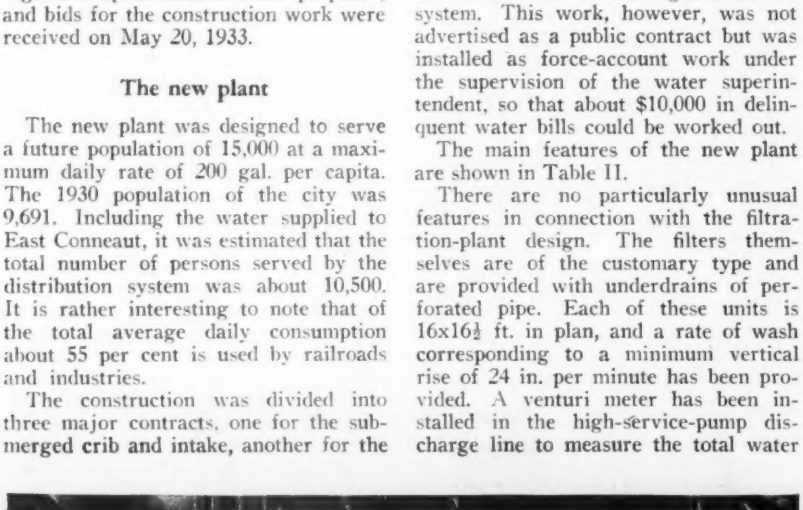


FIG. 2—PIPING ARRANGEMENT in the gallery between the filters.

## Low-service pumping station

On account of the topography of the site, the proper location of many of the plant structures caused some concern in the design of the plant. This was particularly true in the case of the low-service pumping station since the elevation of the ground along Lake Road is about 70 ft. above lake level, and the bluff at the lakefront is quite precipitous and apparently subject to slides. There were obviously two possible solutions of the problem: to extend inland the intake in a tunnel section and locate the low-service pumps in a deep pit beneath the filter building, or to build the low-service station on the lakefront. Comparative layouts and estimates of costs showed the better economy of the latter plan, even though protection of the pumping station against lake action was necessary. Accordingly, the intake terminates in a wet well at the shore end, and the low-service pumps are installed in a building at the foot of the bluff. The discharge line to the mixing chambers is in a comparatively shallow trench and is supported on concrete anchors. A stone breakwater about 330 ft. long was constructed as a protection for the low-service pumping station against possible damage from the lake. This low-service pumping station was excavated in shale, and the surplus excavated materials were disposed of inside the new breakwater.

All of the new structures, as well as those required for future enlargements, are so located that the bank along the lakefront has been left undisturbed, and consequently no troubles from slides or unusual settlements are expected. The foundations for the coagulation basins are protected by steel sheet pilng, while those for the filter building were deep enough to encounter solid material.

## Elevated tank

On account of the limited amount of storage in the old system, it was apparent that some provision should be made for storage of water at an elevation that would make it available for fire-protection purposes. Except in the

extreme western part of the city there was no site available for an underground reservoir that would provide suitable pressure. Also, the layout of the distribution system was such that in order to locate a reservoir in the western portion of the city a large feeder main would be required in addition to a new main leading from the reservoir. In order to reduce present expenditures, it was decided to build an elevated tank at some location nearer the built-up section of the city and at an elevation that would correspond closely with the elevation of the existing standpipe. Accordingly, a site was recommended along the proposed feeder main in the vicinity of Chestnut St. and Lake Erie Ave. and, after considerable negotiation with property owners, a site was finally purchased just east of the intersection of these two streets. The new tank is largely for fire reserve and does not float on the line except at intervals. The plan contemplates that another and higher tank to float on the line may ultimately be located on higher ground when the system is extended to the west.

Even after making test borings, there was much uncertainty as to soil conditions at this site. Accordingly, bids were received upon the basis of a preliminary design, using steel sheetpiling to surround each of the foundation piers, and with provision for altering the foundations after the exact soil conditions had been determined. After the contract was awarded, piledriving tests were made around the central pier, and it was found advisable, on account of the wet sand encountered, to increase the area of the foundation pier beyond that shown on the contract drawings. Interlocking steel sheetpiling was driven around each pier to penetrate the underlying clay, and a reinforced-concrete mat supported by sheetpiling was then poured over the entire area enclosed. Payment for the additional work required for these foundations was made in accordance with a subsidiary agreement.

## Cost of improvements

The total cost of the improvements may be summarized as follows:

| | |
|---|---|
| Submerged crib and intake, filtration plant and 500,000-gal. elevated tank | $209,650 |
| Feeder main from plant and reinforcement of distribution system | 28,100 |
| Extension of Lake Road main | 12,000 |
| Total construction cost | $249,750 |
| Engineering and inspection | 15,000 |
| Advertising, legal and miscellaneous expenses | 5,250 |
| Grand Total | $270,000 |

## Operation of plant

The new filtration plant was placed in operation on March 20, 1934, and has been in continuous service since that time. During this period, on account of the better quality of the raw water, it has been found possible to reduce the amount of aluminum sulphate used as a coagulant to about one-third that used in the old plant. Also, on account of the change from steam to electric power the payroll costs have been reduced more than $5,000 per year. At the same time the cost of electric current consumed has been practically equal to the former cost of coal. The present operating personnel includes three regular operators and one relief man, together with the general waterworks superintendent and the occasional services of a supervising chemist. It is now estimated that the total operating cost of the new plant will not exceed $25,000 per year.

The water is of excellent sanitary quality. Pressures have been maintained in the distribution system somewhat above those previously carried, due to the fact that the water levels in both the new elevated tank and in the existing standpipe are now automatically controlled.

Much of the credit for the final consummation of the water-supply improvements of Conneaut is due Mayor L. R. Naylor, who has taken an active part in the negotiations with the RFC authorities. The feeder main from the new plant was installed under the supervision of Lee Harvey, superintendent of waterworks. The intake and crib were installed by the Merritt, Chapman & Scott Corp., the filtration plant by the Arthur G. McKee Co., and the elevated tank by the Chicago Bridge & Iron Works Co. The design and supervision of construction of the new plant were performed by George B. Gascoigne, with the writer in charge of the work and Jasper W. Avery in immediate charge as resident engineer. The inspection of the work was done by the city, with William Kantola in charge as chief inspector. The operation of the plant is under the supervision of Lee Harvey, with F. J. Hull as supervising chemist.

TABLE II—NEW CONNEAUT WATERWORKS SYSTEM

| | |
|---|---|
| Submerged intake and crib | 24-in. steel-pipe intake 1,900 ft. long. Submerged rockfilled crib. Intake about 1¼ miles west of the mouth of Conneaut Creek. Depth of water over intake about 15 ft. |
| Low-service pumping station | Two motor-driven horizontal centrifugal pumps, capacity 1.5 and 3 m.g.d., automatically controlled by water level in settling basins. |
| Mixing-chambers | 20-min. detention at 3-m.g.d. rate. Motor-driven mixing equipment with reduction-gear units, dry-feed machines for adding alum. |
| Sedimentation basins | Two concrete units arranged for series or parallel operation. Detention period 4 hours at 3-m.g.d. rate. |
| Filtration plant | Four 0.75-m.g.d. filters equipped with rate controllers, loss-of-head gages and hydraulically operated valves. 30,000-gal. washwater tank. Clear-well storage under filters, 180,000 gal. |
| High-service pumping equipment | One 900-g.p.m. and one 2,100-g.p.m. motor-driven, single-stage, horizontal centrifugal pumps, automatically controlled by pressure in distribution system. |
| Buildings | Brick buildings with stone trim. Main filter building provided with steam heating and laboratory equipment, including locker room, office and storage. |
| Elevated tank | 500,000-gal. capacity, provided with automatically controlled valves. |
| Feeder main | 16-in. and 12-in. cast-iron main from new plant to existing distribution system at Broad St. Existing standpipe also equipped with automatic valves. |

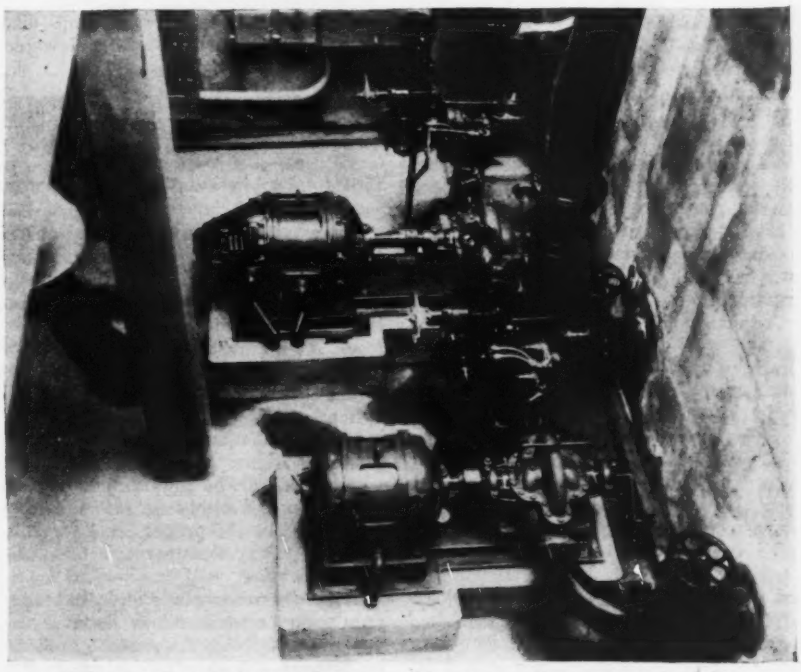


**FIG. 3—PUMPING EQUIPMENT in the high-service pumping station, automatically controlled by the pressure in the distribution system.**

# Pumping Station Layout Fosters Efficient Operation

**Design of Mahoning Valley Sanitary District plant allows low-lift units to receive raw water by gravity flow when reservoir level is high—High-lift units discharge into two cross-connected steel headers—All pumps controlled from operator's pulpit**

THE FOLLOWING ARTICLE is the third to be published in *Engineering News-Record* describing some phase of the new water-supply system for the Mahoning Valley Sanitary District. The first appeared in the issue of March 30, 1933, and described the general outlines of the new system and discussed in detail the preliminary treatment works. The second article appeared in the issue of Sept. 14, 1934, and described the filtration plant, with special attention to the false Wheeler filter bottoms used. The present article takes up the pumping plant. —EDITOR.

By G. Gale Dixon
*Consulting Engineer, Youngstown, Ohio*

THE NEW water-supply system of the Mahoning Valley Sanitary District, which supplies the cities of Youngstown and Niles, Ohio, consists of a large impounding reservoir on Meander Creek, and a 40-m.g.d. purification and pumping plant just downstream, about 2 miles from the center of Niles and 7 miles from the center of Youngstown. Each city is served by duplicate force mains from the pumping station, with a distributing reservoir in Youngstown and a standpipe in Niles.

The pumping plant, which is described in this article, serves both to lift the raw water high enough for it to flow through the filter plant by gravity, when the level in the impounding reservoir is too low, and to pump filtered water to the Youngstown and Niles distributing reservoirs.

## Control of raw water

The works are set at such level that the upper 15 ft. of water in the Meander Creek storage reservoir can be drawn through the plant by gravity. Three 60-in. branch pipes from the supply conduit enter the foundation of the rear portion of the pumping station, two at conduit grade draining the bottom of the reservoir, and one at higher level. Each of these three pipes is controlled by a motor-operated gate valve just inside the building.

When the reservoir level is high, the raw water is admitted through the upper pipe and the excess head is blown down through regulating valves before it passes to the screen well. The upper pipe splits into three 36-in. branches, each provided with a 24-in. stop valve of the automatic-cone type operated by solenoid-controlled hydraulic cylinder, and there are outlets for the ultimate attachment of three regulating valves in parallel as the substructure is designed to accommodate three motor-driven traveling screens. The present installation of equipment consists of one traveling screen, one hand-operated 24-in. regulating valve of the needle type, and a hand-operated 24-in. square bottom gate valve attached to a second outlet for use when the needle valve is out of service.

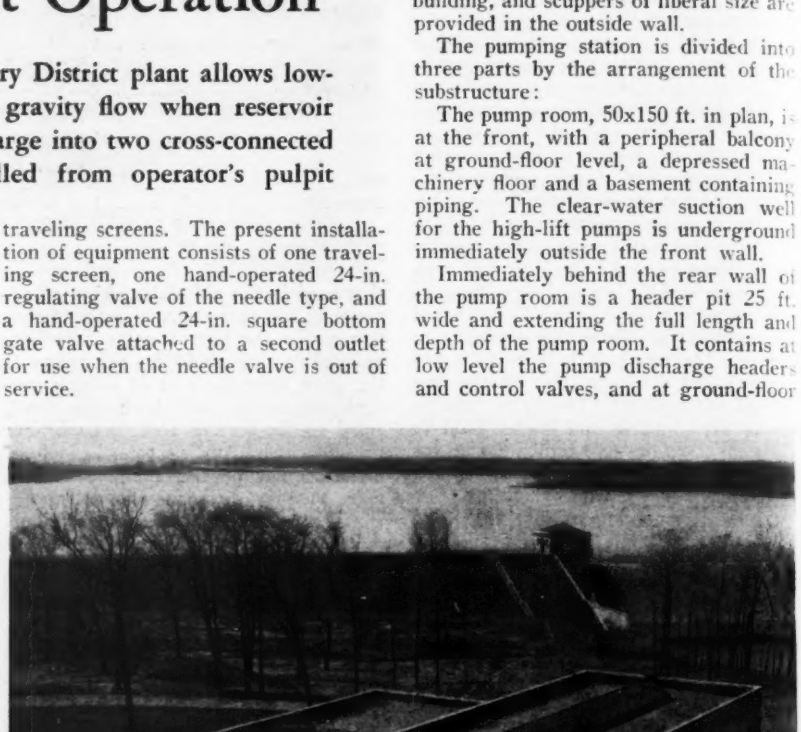


FIG. 1—PUMPING PLANT of the Mahoning Valley Sanitary District is situated close to the new dam and impounding reservoir on Meander Creek.

After screening, the water passes through a sluice gate into the raw-water well, from which it flows by gravity through a 60-in. steel pipe to the preliminary treatment works.

When the reservoir is too low for gravity operation, the raw water is admitted directly into the screen well through the lower branches from the supply conduit, and then flows through a second sluice gate into the low-lift suction well. The low-lift pumps then pick it up and discharge into the raw-water well at the proper level for subsequent gravity flow through the purification works.

When the reservoir is high, improper regulation could result in flooding the pumping station. To prevent such an occurrence, a float switch set in the bay between the regulator wells and the screen wells closes the stop valves ahead of the regulating valves when the water level gets dangerously high. For further insurance, the floor over the regulator wells and the screen wells is 3 ft. lower than that in the rest of the building, and scuppers of liberal size are provided in the outside wall.

The pumping station is divided into three parts by the arrangement of the substructure:

The pump room, 50x150 ft. in plan, is at the front, with a peripheral balcony at ground-floor level, a depressed machinery floor and a basement containing piping. The clear-water suction well for the high-lift pumps is underground immediately outside the front wall.

Immediately behind the rear wall of the pump room is a header pit 25 ft. wide and extending the full length and depth of the pump room. It contains at low level the pump discharge headers and control valves, and at ground-floor level the operator's office, a locker and washroom for the men, and the main switch room.

The rear portion of the building is 41x118 ft. in plan. The substructure is devoted to the control of the raw water entering the plant, containing the valves regulating the inflow, the screen wells, the low-lift suction well and the raw-water well. At ground-floor level the floor space is occupied by the screen room, a small transformer, battery and battery-charging rooms, and a shop.

Access from outside the building to both ends of the header pit and to both suction wells is afforded by large bulkhead doors.

## Arrangement of pumping equipment

The pump room is laid out to accommodate five high-lift and four low-lift motor-driven centrifugal pumping units.

The present installation includes four high-lift units and one low-lift unit, with capacities as follows:

| | Number | Capacity, m.g.d. | Total Lift, Ft. |
|---|---|---|---|
| High-lift pumps | 2 | 20 | 275 |
| High-lift pumps | 1 | 10 | 275 |
| High-lift pumps | 1 | 5 | 275 |
| Low-lift pump | 1 | 30 | 30 |

Each high-lift unit consists of two single-stage centrifugal pumps in series, direct-connected to a self-starting synchronous motor of the two-winding type. The capacities of the units were selected to permit building up the station output by increments of 5 m.g.d. to a total of 35 m.g.d., with a 20-m.g.d. unit in reserve at that rate. One set of extra impellers, which will deliver 20 m.g.d. with a total lift of 325 ft., is provided for service interchangeably in the two large units, to be used when high dynamic head is temporarily caused by cutting portions of the force mains out of service for repair. The three larger units are set in permanent position, but the 5-m.g.d. unit is located in the space that will be required last in the future successive increases in the number of low-lift pumps.

For a number of years, until there is a considerable increase in the demand on the works, the impounding reservoir will remain at a sufficiently high stage to guarantee gravity flow through the plant. Therefore, only one low-lift pumping unit was installed, for occasional service as maintenance work or emergency may require.

The pump-room floor is set at such level that, with about 15-ft. static suction lift, the high-lift pumps can make full use of storage in the clear-water wells of the filter plant, and the low-lift pumps can remove substantially all stored water from the impounding reservoir.

The various pumping units are mounted on rigid concrete frames that extend through to foundation slabs in the basement floor. The basement serves to keep the pump-room floor clear of suction and discharge piping; further, in case of a serious break in the piping, it provides sufficient storage volume to allow time for the manipulation of valves before the water would rise high enough to flood the motors.

Each unit has an independent short cast-iron suction pipe, with every joint accessible. The suction wells are subdivided so that each unit has a separate compartment that can be closed off by stop planks.

The header pit contains two 48-in. main headers of welded steel plate, arranged for the connection of a 36-in. force main to each end of each header, with cross-connections and valve layout designed to give maximum insurance against crippling of the works in case of accident.

At present, one 36-in. force main for the service of Youngstown is connected to each header, at opposite ends of the header pit. Each force-main connection is separated from the header by a remote-controlled hydraulically operated cone valve in a separate watertight vault abutting the end of the header pit.

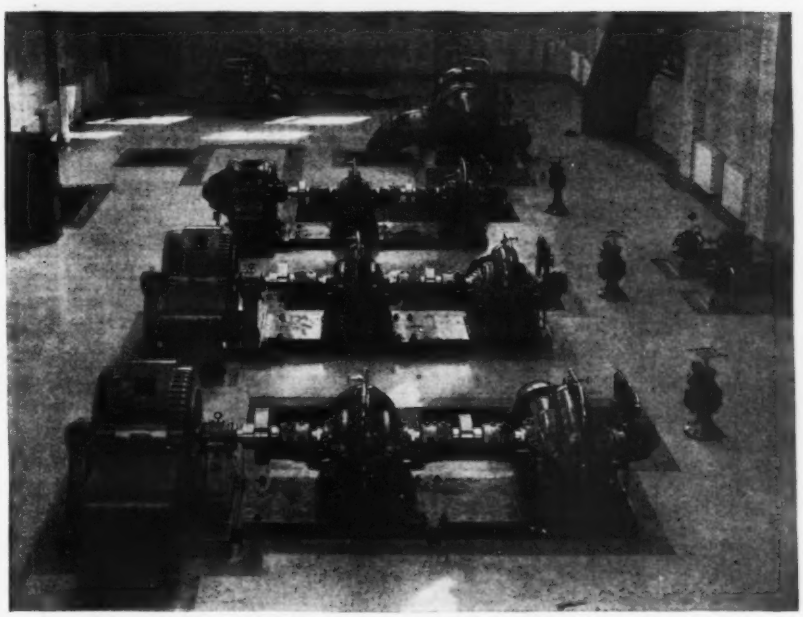


FIG. 2—PUMPING UNITS of the new plant include four high-lift pumps and one low-lift pump. In this view the low-lift unit is in the right background.

There is a separate 24-in. cast-iron header for the service of Niles, connecting with the 20-in. cast-iron force mains leaving each end of the pit, and protected at each end by a remote-controlled hydraulic gate valve in a watertight vault.

Cross-connections between the two Youngstown force mains and between the two Niles force mains are provided at short distances outside the station, and each force main is equipped with a remote-controlled hydraulically operated cone valve on the station side of the cross-connection.

Each of the high-lift pumps is protected by a solenoid-controlled cone check valve, and is connected to each of the main headers by a welded steel branch pipe in the header pit, each controlled by hand-operated gate valves. The check valve is located in the pump-room basement in a short run of cast-iron pipe that discharges through a watertight wall into the branch piping in the header pit.

The low-lift pump is also equipped with a similar check valve and discharges to the raw-water well through a 48-in. cast-iron pipe with a 30-in. remote-controlled cone valve at the discharge end. The second pump will be connected to this same discharge pipe when it is installed, and space is provided to accommodate a second 48-in. pipe for the third and fourth pumps.

The gate stands controlling the various large hand-operated gate valves in the header pit are mounted on a valve-operating deck above the piping, reached by stairway from the ground floor of the station. This deck consists of steel gratings on concrete framing, so the whole space can readily be opened up to give working room when it is necessary to make additions to the piping. The header pit is well lighted, and the operator can see the valves and piping through the grating, so there is little likelihood of his operating the wrong valve. A portable electric motor mounted on rubber-tired wheels is provided to speed up the operation of the large valves and sluice gates about the station.

The pumping-station basement and the header pit are drained to the creek through gated connections and lie at sufficiently high level to drain freely except during an extraordinary flood.

## Plant electrically operated

All equipment in the new works is motor-driven, using current purchased from the local power company—with the single exception of the compressors that deliver carbon dioxide gas to the water in connection with the excess-lime softening process, which are driven by steam produced in the process of manufacturing the gas.

The primary sources of power are a large steam-generating station on the Ohio River at Toronto, Ohio, and a smaller steam plant on the Mahoning River just below Youngstown. These plants connect with a high-tension network which is well looped about the district and is tied in with the other large systems in eastern Ohio and western Pennsylvania. One of these high-tension (133,000-volt) lines connecting with a neighboring system passes within a stone's throw of the district works.

The works are served by two 22,000-volt lines from different substations leading to an outside transformer station on

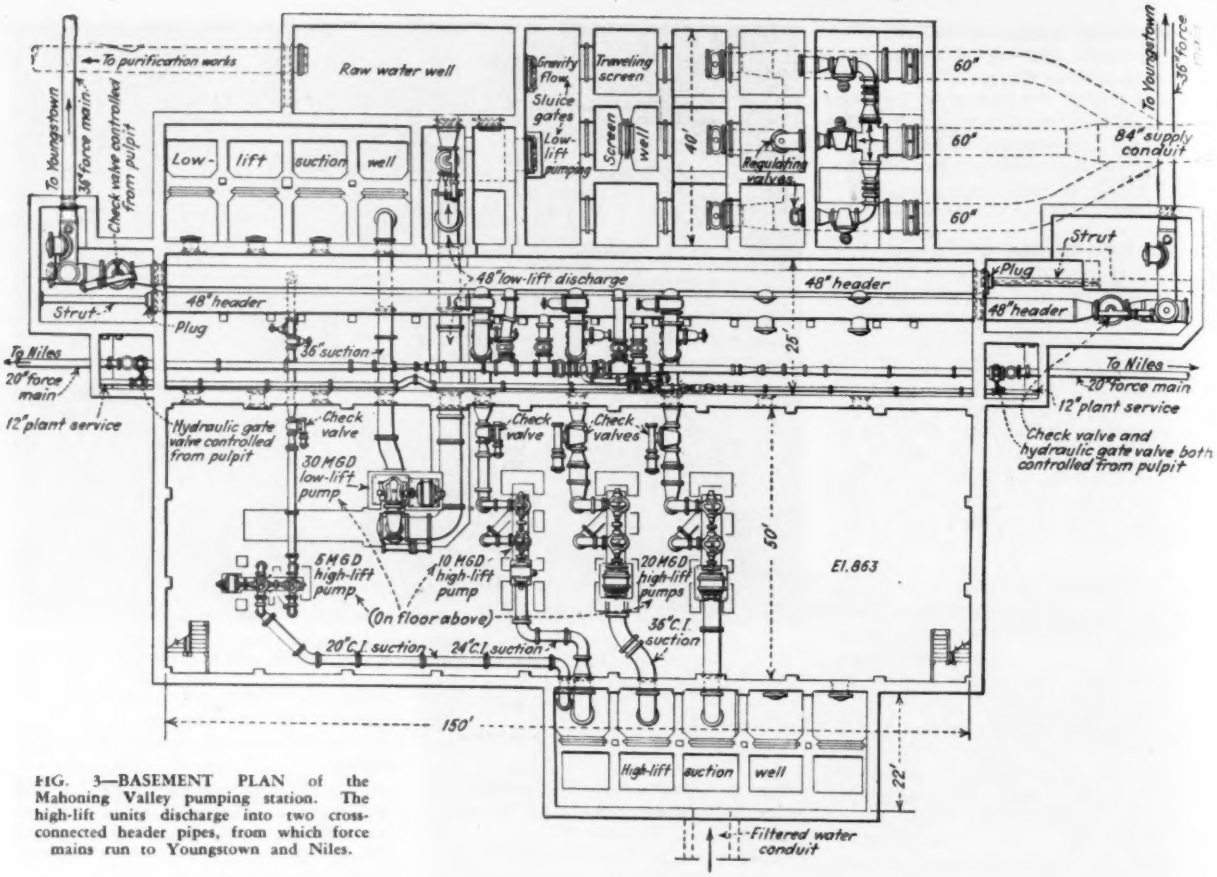



FIG. 3—BASEMENT PLAN of the Mahoning Valley pumping station. The high-lift units discharge into two cross-connected header pipes, from which force mains run to Youngstown and Niles.

district property about 600 ft. behind the pumping station. Here the current is stepped down to 2,200 volts and conducted into the pumping station by lead-covered cable installed underground in fiber ducts encased in concrete. The current is measured at 22,000 volts by meters located in the pumping station. The circuit breakers in the outside transformer station are operated by remote control from a miniature switchboard in the operator's pulpit in the pump room.

High-lift and low-lift pumps are driven by 2,200-volt, 3-phase, 60-cycle motors. Auxiliary equipment generally about the plant operates on 220-volt current from a three-phase transformer bank in the rear of the pumping station; a separate set of transformers provides 110-volt current for lighting. Direct current for operating the oil-circuit breakers, motor-driven gate valves and the emergency lighting sytem, is supplied by a 115-volt storage battery, charged by a motor-generator set running on a 220-volt, 3-phase, auxiliary circuit. A gasoline-engine generator set is also provided for emergency service.

Power is furnished under a twenty-year contract which provides a flat rate of 0.8c. per kw.-hr. of primary power for the first ten years, and 0.7c. thereafter. Studies of the comparative construction and operating costs of steam-turbine and of motor-driven plants showed that over a period of twenty years current would have to be bought at 0.75c. per kw.-hr., in order to make the total expense of an electric station just equal to that of a steam pumping station, with coal at $3 per ton, delivered.

### Electric wiring and control

Two 2,200-volt feeder circuits run from the outdoor substation to the main switchboard in the pumping station, with space provided throughout for a third circuit when it is needed.

The main switchboard is installed in a room formed by wired glass partition abutting on the pump-room balcony and immediately behind the operator's pulpit. The two separate exciter sets, consisting of 2,200-volt motors driving 115-volt d.c. generators, are also located in the main switch room.

The main switching equipment consists of twelve metal-clad, solenoid-operated, oil-circuit breakers of the vertical-lift type, arranged for the ready removal of the breaker unit from the front by

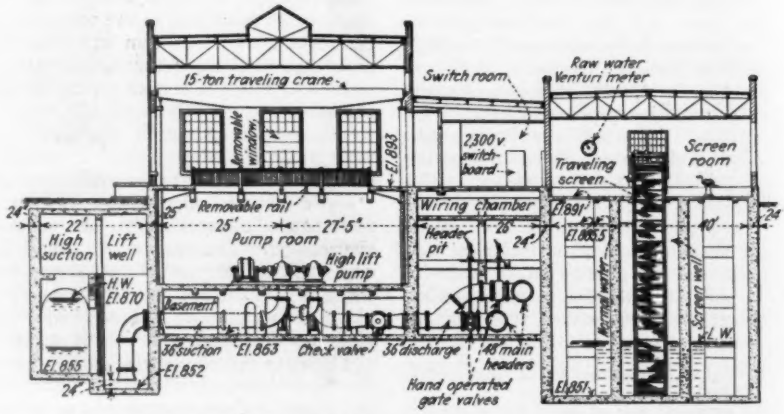



FIG. 4—CROSS-SECTION through the station. The pump piping is contained in the basement beneath the pump-room floor.

means of special removable truck. The twelve units are provided for service as follows:

| | |
|---|---|
| Incoming feeder circuits | 3 |
| Pumping units | 5 |
| Exciter sets | 2 |
| Lighting transformer bank | 1 |
| Auxiliary power-transformer bank | 1 |

There are at present only two incoming feeder circuits, so the third switch unit provides spare parts for emergency repair of the other units.

## Operator's pulpit

The main switching equipment and the circuit breakers in the outdoor substation, together with the main control valves on the incoming supply conduits and the outgoing force mains, are remote-controlled by a miniature switchboard mounted on a bench built about the outside edge of the operator's pulpit, which projects from the balcony out over the pump-room floor.

The miniature switchboard is arranged so that the several panels lie as nearly as possible in the same relative position as do the equipment units which they control, so that a man familiar with the layout of the plant should instinctively reach for the proper switch.

The contactor panels controlling the starting of the synchronous motors that drive the high-lift pumps are mounted on the rear wall of the switch room immediately behind the switch gear; on the pump-room floor adjacent to each high-lift unit is a circuit-breaker that cuts in the second winding of the motor after it has come up to speed.

The speed of the low-lift pumping unit is regulated in ten steps over a range from 170 to 340 r.p.m. by a motor-operated drum controller and resistors mounted on the valve deck over the header pit and controlled from the operator's pulpit.

## Efficiency of pumps

The pumping machinery was bought erected on foundations provided by the district, complete and ready for wire connections, including pumps, motors, check valves, suction and discharge piping within the limits of the pump-room walls, auxiliary switches and contactor panels required for starting the synchronous motors, drum controller for regulating speed of the induction motor, and duplicate motor-driven priming pumps and piping. The contract guaranteed the discharge and over-all efficiency of each unit under several conditions of head, and required shop tests before shipment and station tests after erection. A bonus-and-penalty clause covered any discrepancy between the actual over-all station-test efficiencies of the high-lift units from the guaranteed efficiencies.

The acceptance of the low-lift pumping unit, as far as efficiency of operation was concerned, was based upon separate shop tests of the pump and the motor, as conditions in the station did not permit convenient accurate test after erection.

Table I shows a comparison of the guaranteed and shop-test performance of this unit.

After erection, the low-lift unit was subjected to an endurance run of 72 hours.

TABLE I—RESULTS OF SHOP TEST OF 30-M.G.D. LOW-LIFT PUMP

| Speed, r.p.m. | | Total Lift, ft. 5 | 10 | 20 | 30 | 35 |
|---|---|---|---|---|---|---|
| 340 | m.g.d.—guaranteed | 43.0 | 42.3 | 38.6 | 30.0 | 23.0 |
| | m.g.d.—test | 47.1 | 46.3 | 40.2 | 34.1 | 27.6 |
| | Efficiency—guaranteed | 22.0 | 41.0 | 68.0 | 78.0 | 75.0 |
| | Efficiency—test | ..... | 40.6 | 68.1 | 80.0 | 79.9 |
| 255 | m.g.d.—guaranteed | 34.1 | 30.6 | 15.8 | ..... | ..... |
| | m.g.d.—test | 36.7 | 33.3 | 20.2 | ..... | ..... |
| | Efficiency—guaranteed | 26.0 | 45.0 | 52.0 | ..... | ..... |
| | Efficiency—test | 29.0 | 50.1 | 57.5 | ..... | ..... |
| 170 | m.g.d.—guaranteed | 19.7 | 7.2 | ..... | ..... | ..... |
| | m.g.d.—test | 23.7 | 7.7 | ..... | ..... | ..... |
| | Efficiency—guaranteed | 26.0 | 22.0 | ..... | ..... | ..... |
| | Efficiency—test | 24.5 | 26.5 | ..... | ..... | ..... |

TABLE II—DISCHARGE AND OVER-ALL EFFICIENCIES OF HIGH-LIFT PUMPING UNITS

| Pump No. | Nominal Capacity, m.g.d. | Total Lift, Ft. | Discharge, m.g.d. Predicted | Actual | Over-All Efficiency Guaranteed | Test |
|---|---|---|---|---|---|---|
| 2 | 20 | 250 | 21.9 | 22.02 | 81.0 | 79.41 |
| | | 275 | 20.0 | 20.82 | 82.2 | 82.69 |
| | | 300 | 16.5 | 18.77 | 79.35 | 82.75 |
| | | 325 | 20.0 | 20.09 | 82.30 | 82.96 |
| | | Weighted Average | | | 81.41 | 82.10 |
| 3 | 20 | 250 | 21.9 | 22.25 | 81.0 | 80.58 |
| | | 275 | 20.0 | 20.94 | 82.2 | 83.67 |
| | | 300 | 16.5 | 18.53 | 79.35 | 82.88 |
| | | 325 | 20.0 | 20.09 | 82.30 | 84.03 |
| | | Weighted Average | | | 81.41 | 82.97 |
| 1 | 10 | 250 | 10.95 | 11.56 | 80.3 | 80.33 |
| | | 275 | 10.0 | 10.44 | 80.6 | 81.15 |
| | | 300 | 8.35 | 9.43 | 77.8 | 81.25 |
| | | Weighted Average | | | 79.82 | 80.97 |
| 9 | 5 | 250 | 5.5 | 5.89 | 76.60 | 76.40 |
| | | 275 | 5.0 | 5.39 | 77.80 | 77.73 |
| | | 300 | 4.25 | 4.84 | 75.10 | 78.54 |
| | | Weighted Average | | | 76.83 | 77.60 |

## Testing high-lift pumps

Each high-lift pumping unit was tested for capacity and over-all efficiency after erection in the station, under various conditions of total lift, as is shown in the following tabulation:

| | Duration of Test, Hours | Total Lift, Ft. | Weight Given Test in Averaging Results |
|---|---|---|---|
| All pumping units | 4 | 250 | 1 |
| All pumping units | 8 | 275 | 2 |
| All pumping units | 4 | 300 | 1 |
| 20-m.g.d. units only, with high-head impeller | 4 | 325 | 1 |

During the station tests, the level of water in the suction well was adjusted to give an average static suction lift of about 10 ft. to the center line of pump, and all conditions of operation were held as nearly uniform as possible.

Simultaneous observations of dis-

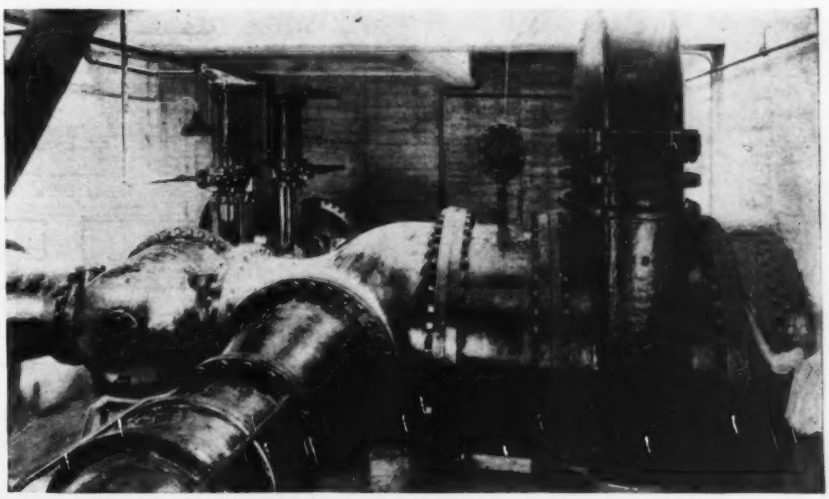


FIG. 5—CONTROL VALVES on the high-level raw-water connection. Three 36-in. branches lead to regulating valves for blowing down the excess head when the reservoir is full.

charge, head and power input were made at 10-min. intervals. The results of the test are reported in Table II.

The weighted average over-all efficiency of the four high-lift units as developed in the station tests was 81.8 per cent, as compared to a guaranteed weighted average of 80.7 per cent.

The contract provided a bonus of $20 and a penalty of $200 per m.g.d. of nominal pump capacity for each 1 per cent by which the over-all efficiency as developed by station test departed from the guaranteed efficiency; with the further provision that any unit that fell below the guarantee by more than 3 per cent might be summarily rejected.

Under these terms the contractor earned a bonus of about $1,200. The contract involved the following amounts:

| | |
|---|---|
| High-lift pumping unit—2@20 m.g.d. | $36,700 |
| High-lift pumping unit—1@10 m.g.d. | 8,500 |
| High-lift pumping unit—1@ 5 m.g.d. | 6,500 |
| Low-lift pumping units | 9,500 |
| Motor-driven vacuum pumps | 1,020 |
| Cast-iron suction and discharge piping | 31,500 |
| Total | $93,720 |

The Mahoning Valley Sanitary District, throughout the period of development and construction, was managed by a board of directors consisting of Jacob D. Waddell, president, of Niles, and Fred A. LaBelle, secretary-treasurer, of Youngstown. Engineering work was directed by William H. Dittoe, chief engineer, with the writer acting in the capacity of deputy chief engineer. The electric wiring and control system was laid out by Crecelius and Phillips, consulting electrical engineers, Cleveland. Edward L. Winslow, Jr., served as resident engineer at the station during the installation and testing of the equipment.

# Inspecting and Recording Condition of Fire Hydrants

By Carl A. Hechmer
*Department Engineer, Washington Suburban Sanitary District, Hyattsville, Md.*

THE FIRE HYDRANT, the connecting link between the water and fire departments, is too often neglected by both of these until a fire occurs and there is an emergency need for its services. Systematic inspection should be made to insure the condition of the hydrant, and a record made of each inspection. Considerable valuable information can be thus made available and the inspection of each hydrant assured.

It is the writer's opinion that fire hydrants should be inspected by the water department and not by the fire department. The fire hydrant is part of the water system and must be maintained by the water department. Inspection gangs of the water department can be equipped to make most necessary mechanical repairs along with their inspection work, while if the fire department is making the inspections it must report defects to the water department and delay will result in making the repair. Should a hydrant fail to close, considerable water will be lost and possible damage done while the fire department is calling out the water department gang.

The following system has been in use in the Washington Suburban Sanitary District for several years.

Field sheets containing the location of each hydrant, and properly routed to eliminate traveling unnecessary distances between hydrants, are used by the field inspection gang. As each hydrant is inspected the date is recorded, and the static water pressure and mechanical condition are noted, as well as the appearance. Mechanical repairs are usually made by the inspection gang. Field sheets are turned in each day, and the information is transferred to a permanent record card that is filed according to district and street location. Recording the static pressure of every hydrant offers ready information regarding the water service in any area, and inquiries from architects and plumbers regarding available pressure in any location can be accurately and quickly given. Study of the pressures by the waterworks engineer will enable him to locate areas in need of additional feed mains, or areas not receiving proper service because of closed valves.

The record card also contains information regarding the make of the hydrant, year installed and length of hydrant barrel. Thus if the inspector reports a grade change, the exact length of the new hydrant required can be determined by referring to the file record card. Also when on emergency calls of broken or leaking hydrants, the exact parts can be carried because all the information is readily available.

For ready reference and check a 600-ft. scale map, mounted on wall board, is used, with colored pushpins for fire hydrant locations. The color of the pin shows the condition of the hydrant as reported daily by the inspection gang. A blue pin is used for a hydrant in good operating condition, a black pin for a hydrant in need of minor repairs but not out of service, and a red pin for a hydrant totally out of service. Thus when a hydrant is reported out of service, it is possible to tell at a glance whether the hydrants around it are in good condition and the area still well protected, enabling the engineer to determine whether the repair can be delayed until the next day. Repeated appearance of a red pin at the same location or in the same area will often lead to the apprehension of people using the hydrant without authority, and thereby prevent unnecessary hydrant damage and assure maximum fire protection.

If several makes of hydrants are in use on the system, the make of the hydrant can be shown by using a small round colored disk under each pin.

Little white celluloid flags on pins can also be used on the map to record the dates of inspections in various areas. The dates can be written on the flags in ink, washed off and corrected with each subsequent inspection. Thus the routing of the inspection gang can be easily accomplished and the progress of inspections easily determined.

RECORD CARD used by the Washington Suburban Sanitary District, on which is recorded the results of the inspection of fire hydrants.

B-219 A
W.S.S.D.
3-30 5C

FIRE HYDRANT
RECORD OF INSPECTION

LOCATION Columbia & Ralston Ave
TOWN OR SUBDIVISION Hyattsville
MAKE Mathews LENGTH 5 ft. DESCRIPTION 8" Main - Dead End

| DATE | REMARKS | DATE | REMARKS | DATE | REMARKS |
|---|---|---|---|---|---|
| 11-26-33 | O.K. 70# | | | | |
| 4-28-34 | O.K. 68# | | | | |
| 6-15-34 | O.K. 70# | | | | |
| | | | | | |
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# Waterworks Design Practices Shows Many Advances

**A symposium of improved practice in waterworks design that have recently been adopted by consulting engineers**

WITH the constantly increasing need for greater reliability, efficiency and economy in the operation of waterworks and the ever-growing public demand for water of higher and higher quality, there has necessarily gone hand in hand a steady development in waterworks design. The following article is comprised of a number of brief contributions by well-known consulting engineers specializing in the design of waterworks plants. Each has set down what in his opinion are the noteworthy advances in design practice that have recently been adopted by him.

In general, these improvements in design are based on two types of advance: increased knowledge of the basic fundamentals of water science and the use of new or improved materials and equipment. For example, greater knowledge of the chemistry and mechanics of coagulation and sedimentation has led to the development of greatly improved facilities for the treatment of water preliminary to filtration, with consequent improvements in the economy of plant construction and operation. The development and use of activated carbon and chloramine sterilization have made possible the meeting of the urgent public demand for water free of objectionable tastes and odors. Improvements in the instrumentation of pumping and purification plants have contributed greatly to the reliability of their operation. The use of new pipe and pipe-coating materials has made possible the solution of many heretofore difficult problems.

In addition to these developments, there has also been a growing demand by industry for the benefits of waterworks engineering knowledge. The paper industry has always been closely associated with developments in waterworks engineering because of the great amount of clear water that must be used in the paper manufacturing process. It is interesting to note that the textile industry, making similar demands for large quantities of water of high quality, has recently displayed a tendency to utilize waterworks engineering knowledge in the solution of its problems.

The following material serves to illustrate the fact that waterworks engineering is far from static; it displays constant growth and development to meet the demands put upon it by growing community needs.—EDITOR.

## New Devices and Materials Used To Better Economy and Reliability

By F. G. Cunningham
*Consulting Engineer, Fuller and McClintock, New York, N. Y.*

RECENT IMPROVEMENTS in our practice comprise both the utilization of new devices and materials and improved judgment in general design. Instances are:

1. The adoption of rectangular mixing tanks, having variable-speed, power-revolved stirrers for preliminary treatment, as at the Middletown, N. Y., York, Pa., and Columbia, Pa., filter plants. These have proved effective, elastic for variable flows, low in head consumption and conducive to economy of chemicals.

2. The improved instrumentation of plants, as through a liberal use of telemeter gages for transmitting readings of flow and water level to central points and synchronous electric clocks for the venturi meters and filter gages. Illuminated dials in the filter gallery, to show the wash rate and washwater-tank water level, have now become quite general practice following the precedents at Richmond, Buffalo and Kansas City.

3. In the iron-removal filter plant of the Sheahan Station at Memphis, a master controller maintains the water level on the filters between fixed limits and divides the flow equally among the filters irrespective of total plant output. Some of its features, designed to prevent "hunting" and abrupt changes in filter rate, were original. The plant requires only occasional visits from the operator.

4. Small screwed steel piping, as for gage lines, oil lines and numerous similar applications, has been shown to deteriorate rapidly and to require considerable maintenance. In our recent work, at Memphis, we have for such service quite generally substituted copper tubing with Parker fittings, with excellent results.

5. In recent designs we have used nothing but lead-covered cable for all main and auxiliary power circuits and all main lighting circuits. We found in older work too many instances where rubber-covered cable, when laid in conduit, failed by reason of moisture from the air condensing in the conduit.

6. Of late we have given increasingly close attention to obtaining an adequate and consistent degree of reliability and flexibility of service in all parts of the plant. The type and arrangement of all interconnections between the various parts of plant layouts, as at Memphis, Kansas City and Dallas, have been the subject of a special study viewed from this aspect.

Such considerations are not new but are vital and too often neglected. The

FIG. 1—THE NEW water-purification plant of the Washington Suburban Sanitary District at Burnt Mills, Md., represents a radical departure from conventional plant layout. Clear well, settling basin and filters form concentric rings around the filter-control house.

number of points at which main and auxiliary service require safeguarding in layouts such as those mentioned is surprisingly large. One or two illustrations may be mentioned. In two plants where four or more low service pumps are required we provided an individual discharge line several hundred feet long from each pump to the mixing basins, in order to avoid the complicated valving and piping that would have been required and the lower reliability that would have resulted if the discharges had been united. At all of the plants mentioned the high-service pumps discharge into ring headers, and are so arranged that no single break of valve or pipe can put out of service more than one pump or one supply main.

# New Features of Design To Improve Plant Operation

By J. F. Laboon
*Consulting Engineer The J. N. Chester Engineers, Pittsburgh, Pa.*

IMPROVED features that have been incorporated in our late filter plant and waterworks designs have been mainly of a nature to affect operating convenience and to improve operating results. In the Erie, Pa., West Side filter plant, recently placed into operation, bronze cloth screens were installed between the gravel and sand beds to prevent the upheaval of gravel that has occurred in many plants, with a consequent impairment of the effluent. Unit heaters for heating the filter room were installed inside the operating tables to produce more efficient heating and improve appearances of the room. Automatic cone stop and check valves were used with each of the high- and low-service pumps in the new pumping stations. The low-service station, on the lakefront, was designed to permit the starting and stopping of pumps from the main high-service station some distance away. Automatic priming devices were provided with electrical control, with indicators located in the high-service station.

In our latest design, the Lancaster, Pa., filtration plant, an existing clarifier tank was transformed into a preliminary settling tank for the removal of coarse coagulated material. The constant removal of settled sludge is provided for by mechanical scrapers and a sludge pump. This tank, which is open, permits ready observation of coagulation, whereas the new final settling basins are covered. The covered basins have been provided with inspection manholes, which are equipped with submarine lamps for determining the condition of the coagulated water and the depth of sludge. Particular attention was given to reducing the distance between the chemical house and the points of application, to eliminate the difficulties inherent in long chemical-feed lines. The chemical-storage and dry-feed-machine rooms have been located immediately over the preliminary mixing chamber and final mixing tanks. Chemicals are applied to the raw water in the preliminary mixing chamber, thus giving an even distribution of chemicals to the raw water before it passes into the six mechanical mixing tanks. In the past this has been accomplished by means of complicated proportional weirs.

Other noteworthy features of this plant are as follows: The master control table has been located in the filter room in contrast to the usual practice of locating it in the main lobby. Cork insulation has been installed over the entire filter-room roof to prevent condensation, usually formed on the ceilings of the filter room under proper atmospheric conditions. The site permitted the installation, apart from the filter building, of two washwater tanks having a combined capacity slightly larger than would be required of a single tank. This permits painting, or repairs, to either without jeopardizing the washwater supply. Streamline copper piping was used throughout the filter-plant for the heating system and other miscellaneous small piping, lending an improved appearance to the piping arrangement. Aerators have been installed for aerating the filtered water to finish off the treatment process.

A 5,500,000-gal., dome-covered steel standpipe, 100 ft. in diameter and of 90-ft. water depth, was built at a cost less than that of a water tower of equal effective capacity.

When the sewage-treatment works go into operation, it is proposed to use the excess gas developed there for heating the pump station and filtration plant.

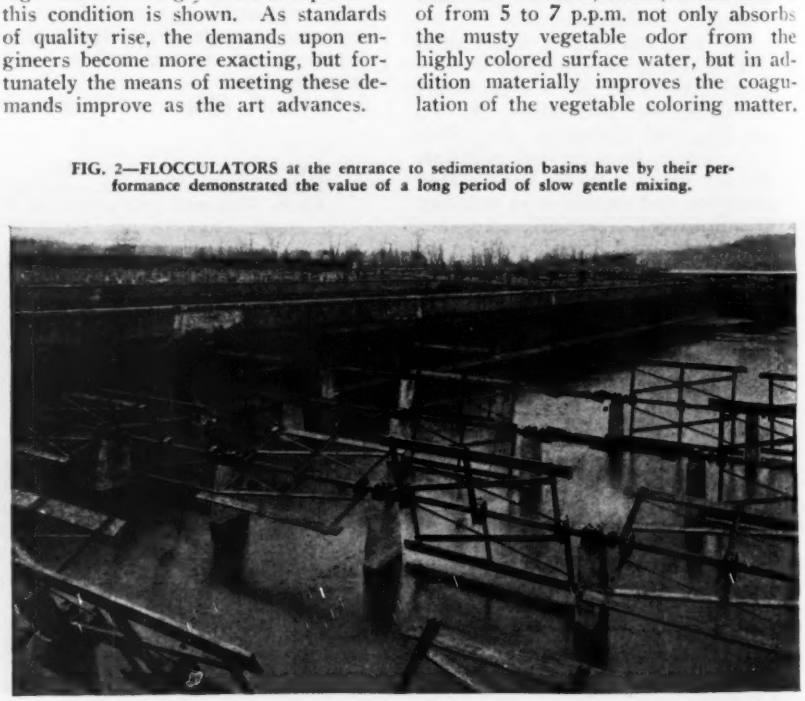
# Demands for Higher Quality Met Through Technical Advances

By Robert Spurr Weston
*Consulting Engineer, Weston and Sampson, Boston, Mass.*

PRACTICE in the waterworks field, particularly in water purification, is constantly changing and improving. In New England no exception to this condition is shown. As standards of quality rise, the demands upon engineers become more exacting, but fortunately the means of meeting these demands improve as the art advances.

Problems of appearance, hardness and corrosion have been the ones chiefly encountered. For the improvement of appearance, activated carbon has been especially useful. Its use was included in the plan for the treatment of the water at Braintree, Mass., where a dose of from 5 to 7 p.p.m. not only absorbs the musty vegetable odor from the highly colored surface water, but in addition materially improves the coagulation of the vegetable coloring matter.

**FIG. 2—FLOCCULATORS at the entrance to sedimentation basins have by their performance demonstrated the value of a long period of slow gentle mixing.**



Activated carbon was recently added to the inlet of a slow filter in an emergency when aerators, ordinarily efficient, failed to overcome a mass attack by Anabaena and Uroglena whose characteristic "pigpen" and fishy odors are so well known and so much disliked.

Activated carbon was again used to counteract the odors arising from the bottom of a reservoir unduly drawn down during a period of low rainfall and high consumption. Here the reduction in pressure above the deposits on the bottom of the pond sets free the gases and products of decomposition accumulated at that point. The carbon was applied to the water as it entered the reservoir and largely overcame the peculiar taste.

For colored waters, chemical treatment and rapid filters are usually indicated, but at Northboro, Mass., the writer's firm has plans ready for a plant in which chemical treatment followed by a long period of coagulation and subsidence and by slow filtration will be the method of purification. This plant is too isolated and too small for constant attendance, and the presence of an operator to wash rapid filters whenever necessary could not be assured. The result was the design of the safer, but regrettably more expensive, slow sand plant.

Zeolite softeners are daily coming into more extensive use. Artificial zeolites with their high exchange values and consequent high rates of treatment are widely used. These artificial zeolites are, however, more sensitive than the natural ones made from green sand. In a recent instance, the carbon dioxide in the raw water was so high that it caused disintegration of the zeolite. The first remedy was to add alkali until the pH was raised to 7.2. More recently, an aerator has been designed to reduce the carbon dioxide, thereby raising the pH and saving the cost of alkali. This aerator is to be placed in a house with air filters in the walls and forced circulation of air to prevent infection of the water with air-borne bacteria.

A deferrization plant is being designed with a contact aerator of the upward-flow type in place of the usual coke trays or trickler. Passing the aerated water through this submerged body affords better contact between the water and the accumulated iron hydroxide, so essential for deferrization. Furthermore, the use of upward-flow submerged areators reduces the pumping head required.

An earlier plant of this type on a private estate has removed manganese successfully from a difficult water high in organic matter and carbon dioxide, a water which usually demands chemical treatment before filtration.

The deferrization plant at Amesbury, Mass., which had given excellent results for years, suddenly failed to perform efficiently. Analyses indicated the accidental admission of surface water of high organic content into the well system. Chlorine was applied with beneficial results. Later on, leaks in the pipes connecting the wells were located and repaired. The chlorine acted to oxidize the organic matter which otherwise held the iron in solution and carried it through the aerators and filters to the distribution system.

The correction of corrosion due to soft acid waters of low pH is extending in practice. Here soda ash and hydrated lime are both used. Better results are obtained from the lime because of the insoluble compounds formed, but the resultant increase in hardness is much feared in many quarters. In one city, however, the change was made from soda ash to lime without causing comment.

In this connection the recent paper of Dr. Hale, showing how excessive treatment with alkali to prevent corrosion may accelerate the formation of deposits in distribution systems and house piping, is being thoughtfully considered. Engineers are learning to steer between this difficulty on the one hand and rapid corrosion on the other.

The threshold of the water consumer's attention, while frequently high, is lowering rapidly and will continue to do so as civilization extends its sway. It is the task of those professionally interested in water supply to be ready with remedies for conditions to which the consumer's attention is drawn.

# New England Textile Mill Installs Complete Water-Purification Plant

By E. Sherman Chase
*Consulting Engineer, Metcalf and Eddy, Boston, Mass.*

AS IN MANY PHASES of engineering, practice in the essential design of water-filter plants continues to be fairly well standardized. There are, however, from time to time, improvements in details and in combinations of equipment.

The writer's firm has recently designed and supervised the construction of a plant for the purification of the industrial water supply of a textile mill in New England. This plant, although small, embodies most of the current practice in filter-plant design. The particular problem involved was the purification of a relatively soft, high-colored surface water of variable quality, so as to produce a clear colorless water of practically zero hardness and devoid of iron.

The purification plant as constructed includes a low-lift pump, dry-feed chemical equipment, mechanical stirring devices for assisting coagulation, a mechanically cleaned settling basin, rapid sand filters with direct-acting rate controllers, and filtered-water reservoir. The filters are washed (high-velocity method) by direct pumping, utilizing washwater pumps equipped with a meter to control the washing rate. After filtration, the water is passed through a pressure zeolite softener. Subsequently a proportional feeder adds alkali to adjust the hydrogen-ion concentration in the final effluent. In view of the necessity for avoiding the taking up of iron from the interior of piping, all pipes and fittings were lined with a bituminous enamel. This precaution was exercised also in connection with the underdrain laterals of the filters.

While the plant as described involves no startling innovations, the fact that it includes most of the features of an up-to-date purification plant shows the recognition by textile manufacturers of the value of modern water-treatment facilities.

# Better Facilities Now Provided For Pretreatment and Filter Washing

By L. R. Howson
*Consulting Engineer, Alvord, Burdick and Howson, Chicago, Ill.*

IN RECENT DESIGNS of filter plants made by this office, the principal advancement has been along the lines of more efficient mixing and settling, more effective washing and greater accessibility to piping and controls.

Following the experimental installation of flocculators in one basin at Louisville and observations of the performance of two other parallel basins, one with and the other without flocculators, which demonstrated that under parallel conditions settled water from the flocculator-equipped basin carried less than half of the turbidity of the water from the basin not so equipped, all of our installations have included equipment to provide a slow gentle mixing over relatively longer periods than have previously been used. Equipment of the paddle-wheel type is being placed in the first passage of settling basins,

and stirring is provided for a period varying from 30 to 45 min. We have used slow mixing following a rapid mixing in softening plants for some years, but only within the last year or two has it been extended to standard filtration-plant design in this office.

Settling basins are being designed of shallower depth, with better diffusion at the inlets and more adequate provisions against short-circuiting. Entrance to the basins is commonly over a weir, thence through a baffle wall provided with slotted openings so spaced as to distribute the flow over the cross-section of the basin. Where topographical conditions require deep basins for economical construction, two-story coagulation is being employed with the second pass of the water vertically over the first instead of alongside it. This usually effects some saving in construction cost and also provides better settling.

With provisions for high rates of washwater application, following the experimental work at Detroit and subsequent observation at many other plants, the size of waste-water conduits has been increased with resulting difficulties of accommodating the large pipes and valves in the pipe gallery. On two recent large installations at Louisville this difficulty was solved by placing the washwater waste at the rear of the filters and outside the building proper. These filters are of the central-gullet type. This arrangement involves no piping, the hydraulic valve being installed directly on the wall separating the wash gullet in the filter from the waste conduit.

More generally, greater attention is being paid to improving the quality of water going to the filters, better facilities for keeping the filters clean, and providing more convenient access to all equipment.

# Experimental Water Plant Gives Great Flexibility

**Complete facilities for basic research into water purification provided by new experimental installation at Armour Institute—Chicago city water to serve as base supply of raw water, but it can be modified by the addition of soluble or insoluble material**

By Harold Vagtborg and T. J. Westerberg
*Assistant Professor of Municipal and Sanitary Engineering, and Graduate Research Student, Armour Institute of Technology, Chicago, Ill.*

APPRECIATING the need for instruction and research work in water treatment, the civil engineering department of the Armour Institute of Technology has installed a 25-g.p.m. water-treatment and filtration plant. The purpose was to provide a complete working plant and experimental equipment that would justify the time spent in research study by graduate students specializing in municipal and sanitary engineering. Its use will also provide students with a more basic knowledge of the many theories encountered in water treatment. So that studies may be made on the detail processes of water treatment as well as on every general method of water treatment now practiced on a commercial scale, the plant was designed for considerable flexibility and includes or provides for all standard treatment processes.

*General Layout* — The experimental water-treatment plant utilizes the lower three floors and basement of a four-story brick building. Extensive alterations to the building were necessary.

By adjustments that can be readily made, the plant will operate as any one of the three general types of water-treatment plants used in present-day practice—filtration, water softening and iron removal.

The sedimentation tank is permanently fixed on the second floor of the building. Preceding and following processes may be altered in elevation so that variations in head may be obtained.

By referring to the flow diagram and the cross-section of the building, the arrangement of the plant may be understood. A raw-water pump having a capacity of 10 to 40 g.p.m. is located in the basement, with its suction connected to each of the two concrete raw-water control reservoirs. This pump discharges to the aeration and chemical-feed channel on the second floor. A meter and a valve in this raw-water line insure accurate measurement and regulation of quantity.

In producing the desired quality of the raw water, materials that will readily enter into solution are added in the raw-water control reservoirs. If the tests require suspended or colloidal materials in the raw water, they are added after the water has been discharged into the aeration channel on the third floor and just prior to mixing. This arrangement prevents the precipitation of suspended materials in the raw-water control reservoirs.

Chemical feeding devices are arranged to allow either dry or solution feed. Facilities for aeration and mixing may be cut out if desired. A reaction basin is equipped with an electric-motor-driven stirring device. At the effluent end of the sedimentation tank provision is made for a recarbonation system when tests are to be run on water softening. Open-channel flow is provided between the sedimentation or recarbonation chambers and the filter, to allow for the installation of weirs. Two filters are provide, one rated at 25 g.p.m. and the other at 5 g.p.m. A filtered-water storage reservoir is situated in the basement adjacent to raw-water control reservoir No. 2. The filtered-

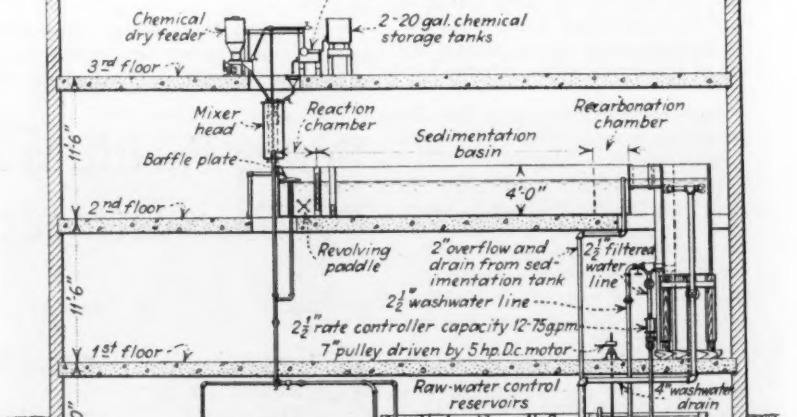



FIG. 1—**EXPERIMENTAL PLANT houses filters on the first floor and preliminary-treatment units on the second floor. After the water has been pumped to the mixing device on the second floor, it flows through the rest of the plant by gravity.**

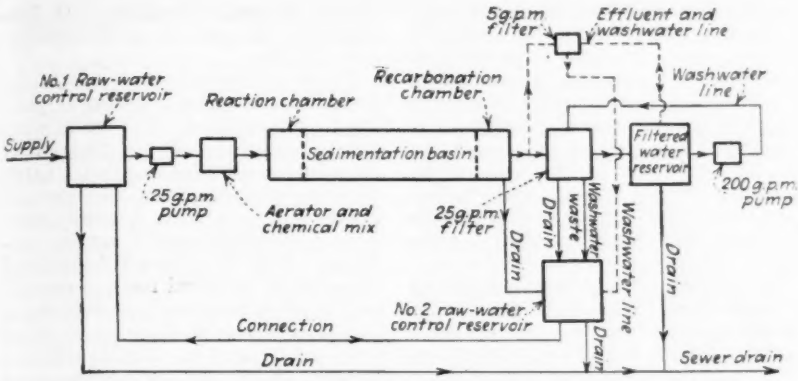



**FIG. 2—FLOW DIAGRAM of the experimental plant. Two interconnected raw-water control reservoirs are provided, one of which receives Chicago city water and the other receives the sedimentation basin effluent and the spent washwater.**

water storage reservoir provides the water used in washing the filters.

*Raw Water Supply*—Two sources of raw-water supply are available at the plant: groundwater and sterilized Lake Michigan water. Investigation has shown that groundwater can be obtained by the use of well-points connected to the 10-40-g.p.m. raw-water pump in the basement. Connection has not yet been made for the present research program does not require this type of water. The water supply now being used is obtained from the Chicago distribution system and is termed the "base supply." Although this water has been chlorinated and is relatively soft and free from turbidity, it is possible by the use of the raw-water control reservoirs to change materially the quality of the base water so that it will have characteristics similar to the raw water treated in typical filtration plants. It will be noted from Fig. 1 that the base supply can be discharged either to the raw-water control reservoir No. 1 or to the aeration channel at the second-floor level.

*Aeration*—As there are a number of methods of aeration, the plant has been designed to allow the installation of several types of systems. The research program contemplates studies of the effectiveness of the various types of aeration, but as the present tests are being run on coagulation and sedimentation, an aeration and mixing device of the aspirator type is used. Chemicals may be introduced to the mixing throat by a separate tube. The aerator-mixer discharges from the up-leg tube over a circular splashplate, which allows the escape of the entrained air. The water then drops into the reaction chamber. When research studies of methods of aeration and mixing are made, other devices will be used to determine their relative values.

*Chemical Feeding*—Dry or wet chemical feeding devices are included in the plant (Fig. 3). For wet feeding, solutions are prepared in 20-gal. vitrified clay crocks and fed through constant-head orifice boxes. Dry materials (artificial turbidity, alum, lime, etc.) are fed by a standard dry-feed machine. A constant stream of water is used for flushing the dry chemicals from the dry-feeder discharge bowl into the mixing throat of the aerator-mixer. The chemical feeding systems have been accurately calibrated so that the operator knows the exact amount being fed at all times.

*Reaction Basin*—The reaction basin includes horizontal paddles attached to a shaft which extends through the wall and connects with the electric motor drive (Fig. 4). Variations in the speed of rotation of the paddle may be obtained by changing pulley sizes. The baffle walls between the reaction and the sedimentation basins can be changed at will. It has been found that the arrangement shown in Fig. 1 is best under the present conditions of operation in research studies of sedimentation.

*Sedimentation Basin*—It is believed by the writers that present engineering practice in the design of sedimentation basins will be materially changed in the next few years. Opinion regarding depth, baffles, trays, etc., in sedimentation basins is quite varied. Provision has therefore been made in the design of this plant for the installation of such internal devices so that tests may be made of the various theories and practices used in sedimentation-basin design. The water depth in the sedimentation basin and the rate of flow through it may be changed so that variations in detention periods of two to ten hours or more are possible.

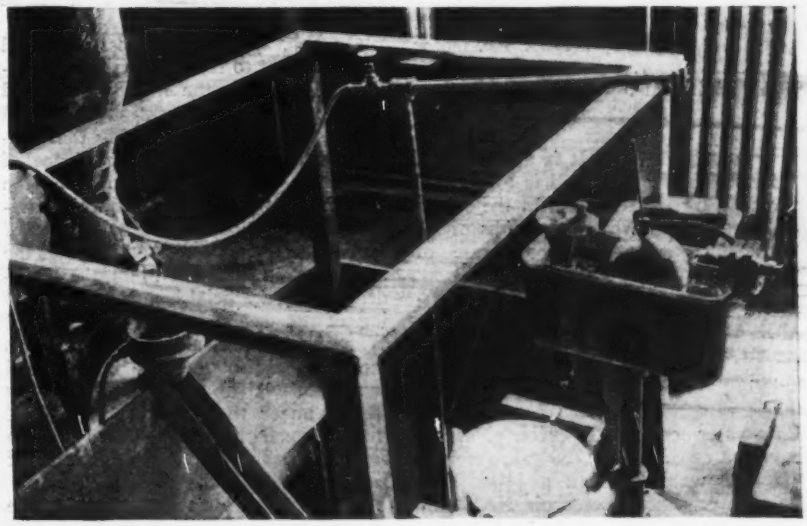
*Recarbonation Basin*—Provision is made for a recarbonation system to be installed at the effluent end of the sedimentation tank, as shown in Fig. 1. This arrangement necessitates construction of a baffle wall and installation of a system of perforated pipes for distribution of $CO_2$.

*Filters*—The 25-g.p.m. filter was designed for a rate of filtration of 125 m.g.d. per acre. The filter is a rectangular wooden box 4½x3 ft. in plan by 8½ ft. deep. It is connected by a channel to the sedimentation tank. The entire filter box and channel are lined with sheets of a galvanized copper alloy. The filter contains a false bottom, to allow for change in the underdrain system at some future date. At present the underdrains are laid in a ridge-and-valley system and consist of six 1½-in. laterals spaced 6 in. apart and connected to a 4-in. manifold, which in turn discharges into the filter effluent line.

There are 50 ⅛-in. round holes in each lateral, spaced on 2-in. centers, offset 22½ deg. from the vertical on the bottom. A union and an elbow connecting the laterals to the manifold allow the removal of any individual lateral (Fig. 5).

The crests of the washwater troughs are arranged to come 24 in. above the sand. An additional 24-in. freeboard enables sufficient flooding depth when filtering. One end of each trough is connected to a 4-in. washwater drain,

**FIG. 3—CHEMICAL-FEED EQUIPMENT in the experimental plant permits the feeding of coaguland either dry or in solution.**



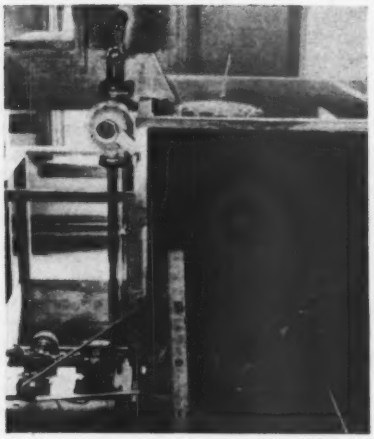


FIG. 4—REACTION BASIN, equipped with motor-driven horizontal paddles. Variations in the speed of rotation are obtained by using pulleys of different sizes.



FIG. 5—FILTER underdrain laterals connect to a manifold that is outside the filter box to facilitate the removal of any one or more of the laterals.

which discharges either into the sewer or to one of the raw-water control reservoirs in the basement.

To control the rate of flow through the filter, a rate controller is installed in the filter effluent line on the first floor. By the movement of a small dial the rate of flow can be regulated from 12 to 60 g.p.m. The filtered water discharges into the basement reservoir.

Water for filter washing is provided by a 200-g.p.m. washwater pump located in the filtered-water reservoir. This pump is operated by a 5-hp., d.c. motor on the first floor.

An additional 5-g.p.m. filter has been installed on the second floor, but the necessary connections have been deferred until needed. It is an 18x18-in. steel tank, 8 ft. deep, and is to be used for comparative testing with the standard filter on all types and depths of filter media, activated carbon, rate of washwater application, etc.

*Storage Reservoirs*—In order to conduct tests on artificially prepared water, it was necessary to provide sufficient storage basins. The basement of the building offered an ideal location for the three reinforced-concrete reservoirs. Raw-water control reservoir No. 1, having a capacity of 1,750 gal., receives the base water through a 1½-in. line. Raw-water control reservoir No. 2 receives the discharge from the sedimentation tank and from the washwater drain. These two basins can be interconnected by operating a valve on a 3-in. pipe that passes through the common wall. A 25-g.p.m. centrifugal pump operated by a ½-hp. motor can pump the water from either or both tanks to the aeration channel through a 1½-in. line. By this arrangement the water may be recirculated through the plant a number of times.

A third tank in the basement, having a capacity of 1,650 gal., is the filtered-water reservoir and receives the filter effluent directly from the rate controller. The reservoir is covered with a tight galvanized-iron roof so that contamination can be eliminated. Each reservoir is provided with a drain and overflow, discharging into the sewer.

*Laboratory* — A small laboratory is provided in the plant for the routine analyses and investigations. Where extreme care must be exercised, the completely equipped chemistry and bacteriological laboratories of the Institute are available.

*Research Program*—A research program to extend over a period of years has been formulated. The initial work will involve tests of the theories of coagulation and sedimentation. Later various arrangements of reaction-tank devices will be tried to determine their relative advantages under varying conditions. Determination will be made of the value of increased reaction periods, to as much as two hours, on flocculation in waters of low turbidity as an aid to increased filter runs. Studies will also be made on the various processes used in treatment, including aeration, mixing, filtration, etc. The plant is designed to allow investigation of the various materials and devices used or contemplated for use in water-treatment plants. This particular work will be done under the general supervision of the director of research and testing.

# Water Resources Report Shows Need of More Data and Fuller Study

## Committee set up at request of Congress reports to the President on coordinated development of the nation's water resources

THE NEED for additional data, for accurate maps, and above all for a definite statement of federal policy concerning the desirable extent and character of federal participation in various kinds of water-use projects is the outstanding feature of a preliminary report upon the development of the nation's water resources that was transmited to Congress by the President together with a special message on June 4 (*ENR*, June 7, 1934, p. 751). At that time only the message and a brief summary of the report were made public. Now the report has been printed and soon will be available for distribution.

On Feb. 2, 1934, Congress requested the President to report upon "a comprehensive plan for the improvement and development of the rivers of the United States, with a view to giving the Congress information for the guidance of legislation which will provide for the maximum amount of flood control, navigation, irrigation, and development of hydro-electric power." Acting under the authorization thus given him, the President set up a special committee consisting of the Secretaries of the Interior, War, Agriculture, and Labor, and this committee named a group of technical subcommittees to make the necessary studies under the general direction of the National Planning Board of the Federal Emergency Administration of Public Works.

For the purposes of the report the country was divided into six regions, Atlantic, Gulf, Lake, Eastern Mississippi, Western Mississippi and Pacific, and the subcommittees were appointed to report upon each of these regions, consisting of representatives of the War Department, Department of the Interior and Department of Agriculture. In addition, technical advisory committees were set up within the several federal departments for the assistance of the regional committees.

The preliminary reports of these several committees are now contained in House Document No. 395, 73d Congress, 2nd Session, under the title "Development of the Rivers of the United States." This document contains the President's message of June 4, the report of the President's committee on water flow, reports of the technical advisory subcommittee on organization and policy, the report of the several regional committees, and a review of the reports of the regional committees by a reviewing committee set up within the Department of the Interior.

In his message to Congress the President stated that any studies covering the subjects of flood control, navigation, irrigation and the development of hydro-electric power automatically opened the door to all interrelated subjects that come under the general head of land and water use. Consequently the program laid down for the several regional committees had been expanded by the

Cabinet committee to cover the following: (1) navigation improvement (*a*) for the benefit of navigation within the interior of the United States, and (*b*) to provide for navigation by ocean vessels; (2) power development; (3) protection of municipal and domestic water supplies; (4) investigation and development of groundwater supplies; (5) land conservation consisting of (*a*) rural land-use adjustments and (*b*) soil-erosion control; (6) forest protection and maintenance; (7) collection of additional basic streamflow data; (8) increased opportunities for recreation and the promotion of wild life; and (9) the protection and regulation of commercial fisheries.

Based upon the findings of the technical subcommittees, the main committee, in full recognition of the preliminary and tentative character of any recommendations based on available facts, selected ten drainage basins as being the most promising ones for further development when comprehensive plans shall have been prepared. The selected river basins, in order of priority, are as follows:

1. Tennessee Valley
2. St. Lawrence-Great Lakes Basin
3. Mississippi - Main stem
4. Missouri, including the Platte
5. Sacramento - San Joaquin
6. Delaware River Basin
7. Columbia River Basin
8. Colorado River Basin
9. Ohio Valley
10. Great Salt Lake Basin

The Tennessee Valley work was placed first on this program because of the start already made and the necessity for additional steps to secure the desired results already outlined and approved by Congress. No reason is given for including the St. Lawrence-Great Lakes Basin as second in the list. Work on the main channel of the Mississippi is favored in order to complete the present flood-control project and because the region presents an opportunity for comprehensive planning. The Missouri Basin is included in order to continue projects already begun on the Platte River for power and irrigation. The urgent need for more water in the Sacramento-San Joaquin Basin is given as the reason for including that area, and also because the plan for its development has been well worked out by the state of California. The Delaware River Basin is included on account of the immediate plans of New York City to go to the Delaware for additional water, because of Philadelphia's future needs, and because of the existing high pollution in the Delaware at Philadelphia. The Columbia Basin is included because of the government's large present commitments at Bonneville and Grand Coulee, also because of the government's large land holdings in that area. The Colorado Basin also is included because of the government's present commitments. The Ohio Basin is included on account of the great social and engineering problems involved in proper development of its water resources, also because of the need for a study of the future of the coal miners, development of submarginal lands and stream-pollution problems. The water-supply needs and land-reclamation problems of the Great Salt Lake Basin are given as the reasons for including that area.

The committee of engineers set up within the Department of the Interior to review the regional report recommended that the federal government participate in an orderly program for the development of the Rio Grande Basin, also that it give favorable consideration to the Illinois River Basin.

### Handicaps to the study

The regional subcommittees found their work handicapped by the lack of accurate maps, for lack of much desirable information, and the scattered character of the available information. The Corps of Engineers, U. S. Army, in the progress of its study of the navigable streams of the United States and their tributaries for the purpose of navigation, power development, flood control and irrigation, begun in 1927, has collected and compiled much of the basic data needed for the study of those particular subjects, but information on such subjects as land use was fragmentary or entirely lacking.

These committees further pointed out that there is a need for a new statement of policy concerning the desirable extent and character of federal participation in various kinds of water-use projects. It pointed out that the federal government has long assumed responsibility for navigation projects and that on the lower Mississippi and in one or two other cases it has participated in flood-control efforts, also that through the Boulder Dam project and the Tennessee Valley Authority direct federal responsibility for power development has recently been assumed, but even these leave many moot questions as to the proper distribution of responsibility and costs between federal, state and local government agencies. Problems in this field include relations between states, such as are involved in the negotiation of interstate compacts, also questions of responsibility among federal bureaus and the apparently inconsistent policies followed by such bureaus.

Another series of questions raised by the committees related to charges for use of water resources—whether in the form of tolls, taxes, light or power bills, sewage fees, irrigation charges, etc. They called attention to the fact that no general policy has been adopted except in the field of navigation, where there is now much doubt and debate.

Commenting on these questions, the Cabinet committee, in its report to the President, stated that there is a need for a restatement of principles on this whole subject before the financing of any of the projects listed in the subcommittee reports is carried further.

Finally, the committee states, there is need for a new statement of the criteria dictating choice and priority of various projects. It is essential that projects be planned not only for the use of all the water resources in any given basin, but that the order of executing projects should be studied to make each individual effort a useful and effective part in the development of the whole stream.

The Secretary of War, in a separate communication to the President, takes strong exception to the statements in the general report as to the lack of data necessary to a full compliance with the request of Congress. He points out that under a provision of the River and Harbor Act of 1927 the Corps of Engineers over the past seven years has spent upwards of $10,000,000 upon a study of the beneficial use of the waters of the principal streams of the country (other than the Colorado River) and that the majority of the reports required under that act have been transmitted to Congress; the remaining reports are sufficiently advanced to permit the necessary information to be concisely set forth. By Congressional mandate this study was restricted to navigation, hydro-electric power, flood control and irrigation, but the Secretary points out that if it is desired to add studies on stream pollution, soil erosion, reforestation and sociological planning these can be superimposed upon the data already submitted. He states further that the Army Engineers now have a familiarity with water-use problems that could not be acquired by any new group without years of intensive and continuous study and that the Secretary of War and the Chief of Engineers can, within a very short time, prepare a comprehensive plan such as Congress has requested. To supersede them now, he states, instead of seeking their cooperation, would be an inefficient procedure.

### Further studies

The Cabinet committee, in concluding its report, states that the basis of a comprehensive plan for water policy lies in (1) adequate facts, maps and general information easily accessible and in comparable form; (2) continuous study and refinement of plans for the full development of river basins with coordination of present agencies engaged in elements of the work; (3) agreement upon a statement of principles to govern division of responsibility and costs as among federal, state, municipal and private parties, for various kinds of projects and combinations of projects; (4) agreement upon the statement of principles to govern the extent to which various kinds of projects shall be charged to the users and on methods of apportioning such charges; and (5) agreement upon a statement of the social, economic, physical and geographical criteria for choice and priority of projects and units.

# Designing a Water Supply for a Golf Course

**Water demand of a golf club is characterized by a low load factor—Fairway irrigation, a practice now favored, is accomplished by either of two systems, one of which requires the use of hose to supplement the piping**

By Paul E. Green and George L. Opper
*Marr, Green & Opper, Consulting Engineers, Chicago, Ill.*

THERE ARE more than 5,000 golf courses in the United States. To a large degree, their popularity depends upon the condition of the turf, which in turn hinges upon the question of water supply. The following article outlines the major points involved in placing this supply problem on a sound engineering foundation.

A standard eighteen-hole golf course consists of eighteen greens, about thirty-six tees and fourteen fairways. The greens and tees are always watered, and the tendency now is to water or irrigate the fairways also. In addition, the club house requires water for ordinary kitchen, dining room, toilet, bath and shower purposes. Many clubs have swimming pools, and some have water-softening plants for the club house.

An estimate of the average quantity of water required for a non-irrigated course may be made, bearing in mind that it will vary considerably depending on soil and climate, as follows: club house, 10,000 gal. per day; 36 tees and greens, 97,200 gal. per day; miscellaneous, help's quarters, etc., 2,800 gal. per day; giving a total of 110,000 gal. per day, or an average of 80 g.p.m.

The rate of water demand, however, varies greatly throughout the 24 hours. The rush on the showers will occur from 4 to 7 p.m., which will also coincide with the peak load on the kitchen. As the sprinkling of the greens may have been started at that time, the real peak load may consist for a short time of a combination of all these factors.

The hose sprinklers for the greens and tees (rarely more than 27 in use at one time) discharge about 6 g.p.m. each. The showers use from 10 to 12 g.p.m. each, and the usual equipment of showers, including those for men and women, is from ten to twelve. The peak demand, therefore, may be summarized as follows:

| | |
|---|---|
| 10 showers, 10 g.p.m. each | 100 |
| 27 sprinklers, 6 g.p.m. each | 162 |
| Other club-house water, g.p.m. | 28 |
| Total, g.p.m. | 290 |

This amount must be available for two hours or more. Storage of not less than 30,000 gal. should be available, and, in addition, fire protection will require further storage of 30,000 gal., or a total of 60,000 gal. Such an amount will be satisfactory for a course on which the fairways are not irrigated.

The distribution system for sprinkling tees and greens usually consists of a simple lay-out of steel piping varying in size from 1 to 4 in. in diameter, terminating in globe-valve hydrants located upon the back slopes of the areas to be served. The distribution pipes are generally laid with shallow cover and are supplied with facilities for draining at the end of the playing season. Hose and sprinklers are used for distributing the water on the turf as required. To eliminate the labor cost of shifting hose and sprinklers, a later development of fixed pop-up sprinklers or snap-on hydrants has been developed and used extensively for tee sprinkling.

The water-supply plant for the greens and tees need not be elaborate but must be of adequate capacity and have a dependable performance. It frequently comprises duplicate pumps, independent of the club-house supply, and pressure tanks to provide for fluctuations in the demand, with automatic motor control. The sanitary quality of the club-house supply should be insured, and if two sources are utilized no cross-connections should be permitted.

## Irrigating the fairway

*Sprinkling Requirements*—The fairways of the average eighteen-hole course comprise from 50 to 60 acres. There are usually four short holes having no fairways. The other fourteen fairways average 300 yd. long and are about 60 yd. wide. Enough water should be applied to give this area a good soaking twice a week if necessary, and portions of it oftener, depending on the character of soil. The bulk of the sprinkling may be done at night. Pumping and storage facilities for delivering an equivalent of ½ in. of rainfall over the area of two fairways at one time is the usual maximum capacity developed. This quantity of water may be applied in a period of one hour or longer and will usually keep a clayey soil in good condition and the grass vigorous and healthy. The actual amount required varies greatly and can only be determined by study and experiment, but the water applied should not be less than the amount indicated.

*Pumping Plant*—The pumping plant should be simple, flexible and reliable, and since there is a large range in the demand, two or three interconnected pumps are required. They should be automatically placed in service as the sprinkler load is attached. Otherwise the cost of operation will be excessive.

HOSELESS FAIRWAY water system in Griffiths Park, Los Angeles.

In the selection of equipment consideration should be given to the fact that the plant is operated for only a part of each year. The equipment should be housed in a permanent, tastefully designed building which need not be elaborate or expensive but should blend with its surroundings. The working pressure at the pumps depends, of course, on the topography as well as the pressure required at the sprinkler nozzles to get the proper distribution.

*Watering Systems*—Fairway irrigation systems have been developed along two general lines. One system employs portable sprinklers, set by hand at desired locations, served by the necessary amount of hose from fixed hydrants usually located at the edge of unmowed area. This system has become known as the hose system. The other general

type is known as the hoseless system. In its early form it used small fixed concealed sprinklers set in large numbers over the fairway. Later the perfection of the snap-on valve or quick-coupling hydrant led to the installation of larger-capacity sprinklers which cover larger areas.

*The Hose System*—In the hose type of distribution the mains are laid in the rough between the fairways so that two fairways may be served by one main. Short laterals run to hydrants at the edge of the fairway at intervals of about 150 ft., to which are attached 1- to 1½-in. hose. The sprinkling heads have capacities from 15 to 25 g.p.m. each and a maximum circular coverage of approximately 120 ft. with 25- to 50-lb. pressure at the nozzle. About twenty sprinklers are used at one operation, three to five fairways being covered in one night. Its extreme flexibility, low operating cost and adaptability to all conditions always recommend it. Good quality high-pressure hose will have a normal life of four or five years.

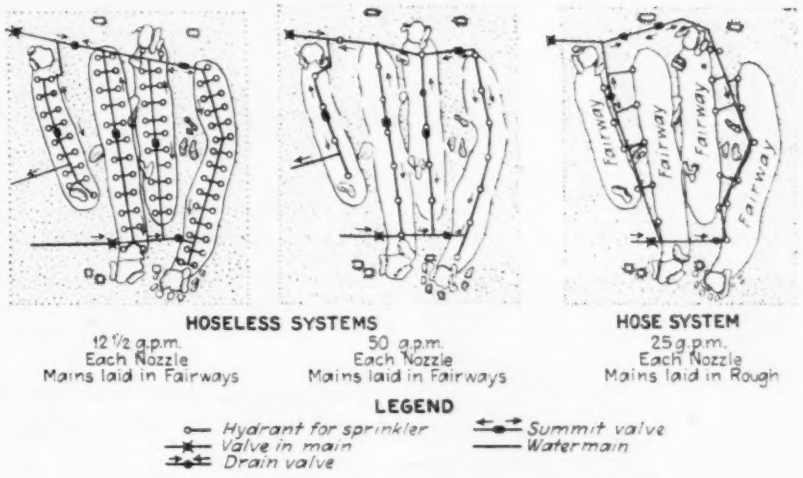
*The Hoseless System*—Of the two types of hoseless systems in use, one called the California system has fixed, concealed pop-up sprinklers of relatively small capacity distributed in a uniform pattern over the area to be served. These sprinklers are placed in operation in groups by manipulating control valves on the mains. The second type has fixed concealed hydrants, to which are attached quick-coupling sprinklers automatically placed in operation by the attachment of the sprinkler head.

The concealed sprinklers of the California system, when not in use, are flush with the turf surface, and the nozzles are within the head. When in operation, the nozzle rises about an inch above the ground surface. The piping system required for this type of sprinkler must be laid to grade, subdivided and valved sufficiently to serve the area efficiently. It is not as flexible as the concealed hydrant type of system and requires a large number of sprinklers, valves and drains to serve the normal course. Because careful maintenance of the sprinkling heads is required its use has been largely limited to green and tee sprinkling or lawn areas.

The hoseless system utilizing snap valves and quick coupling sprinklers has been more extensively used in the past few years. This system may be designed with the snap valves or hydrants located at the ends of small laterals, serving sprinklers spaced at uniform intervals, or the hydrants may be located at intervals along a main centrally located in the fairway. In the first case the sprinklers have a capacity of from 10 to 25 g.p.m. with a coverage circle 60 to 110 ft. in diameter. In the second case the sprinklers have a capacity of 50 g.p.m. and water a circle 150 to 200 ft. in diameter.

Where snap valves are located on a grid of laterals on the fairway it may require from 350 to 800 outlets to cover the normal eighteen-hole course, depending upon the fairway area, topography, number of greens and tees and lawn and garden space to be served. The mains and laterals are pitched to drain and usually are laid with shallow cover. Hose lines serving sprinklers may be attached to the fixed hydrants when supplementary sprinkling is required. This system is ordinarily designed with a capacity sufficient to sprinkle two fairways at one time. The sprinklers require from 20 to 45 lb. at the nozzle.

If hydrants are located along the center of the fairway, from 75 to 120 outlets will be required, depending upon the length of the course and service desired. The hydrants or sprinklers may be adjusted for delivery, but some supplementary sprinkling with hose is usually required to obtain uniform coverage. Since the capacity of these sprinklers is relatively large and requires 100 lb. or more pressure at the nozzle, the system must be designed and operated with care. Owing to the high operating pressures, high-quality sprinklers of sturdy design are required to avoid mechanical difficulties. These large sprinklers are not adaptable to green and tee sprinkling, and usually smaller hose sprinklers are employed.




**TYPICAL LAYOUTS** of two types of fairway watering systems.

The foregoing description of a golf-course fairway-sprinkling system is of necessity of a general nature, since each course will have its individual problems. The source of supply or type of pump have not been discussed, nor have many other features. Enough has been said, however, to show that proper design is an engineering problem.

In order to compare costs, three estimates of an actual design are tabulated. These are for the fairway-irrigation system at the Sunset Ridge Country Club at Winnetka, Ill., a suburb of Chicago. For fairway sprinkling alone, two centrifugal pumps, one of 150 g.p.m. and one of 500 g.p.m., are provided. In addition, there are two small house pumps and a steel pressure tank for the club house and green and tee supply.

The hose system, owing to its lower first cost, flexibility of operation and adaptability to an existing green and tee system, has been adopted extensively for fairway-watering systems. The California hoseless system, because of the difficulty of maintaining numerous fixed concealed sprinklers and its large first cost, has been supplanted largely by the hoseless system employing snap-on valves or hydrants and quick-coupling sprinklers.

The labor cost of operating the various types of fairway-watering systems is about equal. The first cost, power cost and available water supply usually dictate the selection of the type of the installation.

Because of its economy the hose system is often chosen, but since the hoseless system requires less time for the application of water, it is frequently preferred where funds are available, even though the power-operating cost may be greater.

**COMPARISON OF COSTS OF HOSE AND HOSELESS SYSTEMS AT THE SUNSET RIDGE CLUB**

| | | Hoseless Systems | |
|---|---|---|---|
| | Hose System | Central Fairway Main Using Large Sprinklers | Mains and Laterals with Small Sprinklers |
| Mains and accessories | $9,942 | $12,466 | $17,960 |
| Earth reservoir | 2,555 | 3,155 | 3,155 |
| Pumping machinery, piping and meters | 6,372 | 11,001 | 8,551 |
| Resodding trenches | 95 | 270 | 620 |
| Engineering and inspection | 1,136 | 1,608 | 1,814 |
| | $20,100 | $28,500 | $32,100 |

# From Job and Office

## Removable Grade Hubs for Siphon Invert

**METAL GRADE MARKER** in place on projecting bolt; truncated cone is screwed down upon the nut, locking both in position.

IN PLACING the invert of concrete siphons along the aqueduct being built by the Metropolitan Water District of Southern California, it was desirable to find some way to set grade markers that would be of substantial form without requiring much time or expense. The method devised uses the pier and bolt shown in the accompanying illustration.

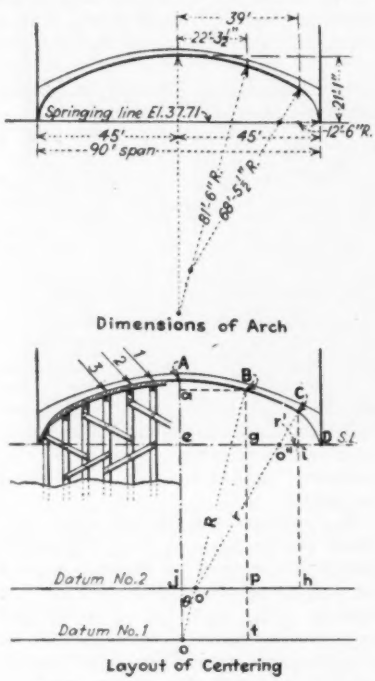
The first operation was to cast concrete piers on both sides of the invert center line at about 5-ft. intervals to serve as supports for the steel reinforcing and also for use in supporting grade markers for the inner surface of the invert. When the concrete was poured in these piers there was placed in each one a ¾-in. steel bolt projecting about 6 in. above the pier top and set at an angle normal to the invert surface at this point. Some 2 or 3 in. of the projecting end of this bolt was threaded. For use on these threads the machine shop supplied the usual square nuts and also truncated metal cones with a 2-in. base width and a height of about 2½ or 3 in. These cones had central holes threaded to fit the bolt.

The piers were set only roughly to grade, that is within an inch or two. When the time came to set grade for the invert, the transit man used these bolts and cones to establish exact elevation at each pier. This was done by putting a nut on the bolt and turning it down the threads until the truncated cone following it had its upper surface at the exact elevation required. Then, by tightening up with a wrench, both cone and nut were held firmly in place. The base of each cone was slotted to receive the blade of a large screwdriver, with which the cones were unscrewed and removed after the concrete had begun to set. The device was developed by the man in the picture, M. Hjalmarson, superintendent for the Metropolitan Water District at the Fan-Hill siphon.

## Determining Elevations for Centering for an Arch Bridge

By Charles Curry, Jr.
*North Plainfield, N. J.*

IN THE upper sketch of the accompanying figure 1 is shown a system of radii for the intrados of a five-centered concrete bridge. From the data given it is necessary to find elevations at any point along the intrados for the purpose of erecting posts for the centering, as shown in the lower sketch of the figure, and also for checking the forms at any point along curve *AD*.




**SKETCHES OF BRIDGE** and of the geometric relations between radii of the five-centered arch.

Datum 1 and 2 are parallel with the springing line and pass through the center points, *O* and *O'* respectively.

$$\sin\theta = aB/R$$
$$jo' = \sin\theta\,(R - r)$$
$$Oj = \cos\theta\,(R - r)$$
$$je = R - (Oj + eA)$$
$$eO'' = eD - r'$$

Any point on Datum 1, measured from *O*, between *O* and *f*, will fall under the arc *AB*. The elevation of the intrados above this point is:

$$\text{Elev.} = \sqrt{R^2 - \text{distance}^2}$$

Any point on Datum 2, measured from *j*, between *p* and *h* (that is, between 22 ft.-3½ in. and 39 ft.) will fall under the arc *BC*. The elevation of the intrados above this point is:

$$\text{Elev.} = \sqrt{r^2 - (\text{distance} - jO')^2}$$

Any point on the springing line, measured from *e*, between *i* and *D* (that is, between 39 ft. and 45 ft.) will fall under the arc *CD*, and the elevation of the intrados above this point is:

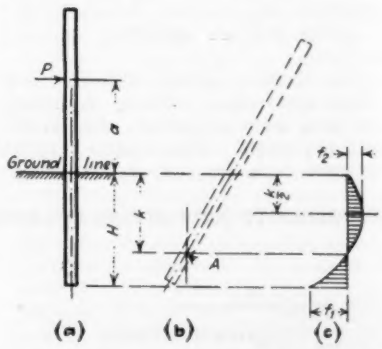
$$\text{Elev.} = \sqrt{r'^2 - (\text{distance} - eO'')^2}$$

## Smokestack Foundation Designed Against Earthquake

By L. T. Evans
*Long Beach, Calif.*

IN THE DESIGN of the Long Beach school buildings to withstand future earthquakes, every precaution has been taken to protect lives and property. Excessive deflections have been cut down, horizontal trusses or diaphragms have been added, and all piers have been calculated to withstand a horizontal loading of at least 0.1*g*, or a 20-lb. per sq..ft. wind force.

One novel feature that arose on one of the buildings that the writer designed was the foundation treatment of a smokestack. In order to separate the stack from the other structures, it was considered advisable to design the foundation for it in the same manner as is done for poles. In the accompanying sketch the stack shown is acted upon by a load *P*, which may be taken as the resultant of the wind or earthquake load. Due to the action of the load, the stack will rotate about some point *A*, as shown in the sketch *b*, bringing into ac-




**DESIGN CONDITIONS** for a stack to resist earthquake loads.

tion the passive earth resistance. If this earth pressure is taken as a linear function of the depth, the resistance pressure diagram indicated at $c$ is obtained. Taking the pressure diagram as being made up of parabolic curves and utilizing the equations $\Sigma H = 0$ and $\Sigma M = 0$, the following relations result:

$$f_1 = \frac{6P}{d\,H} + \frac{12\,Pa}{d\,H^2}$$

$$H = \frac{3\,P}{df_1} + \sqrt{\frac{12\,Pa}{df_1}}$$

$$k = \frac{d\,H^2 f_1 - 4\,Pa}{2P + d\,Hf_1}$$

$$f_2 = f_1\left[\frac{k^2}{4\,H\,(H-k)}\right]$$

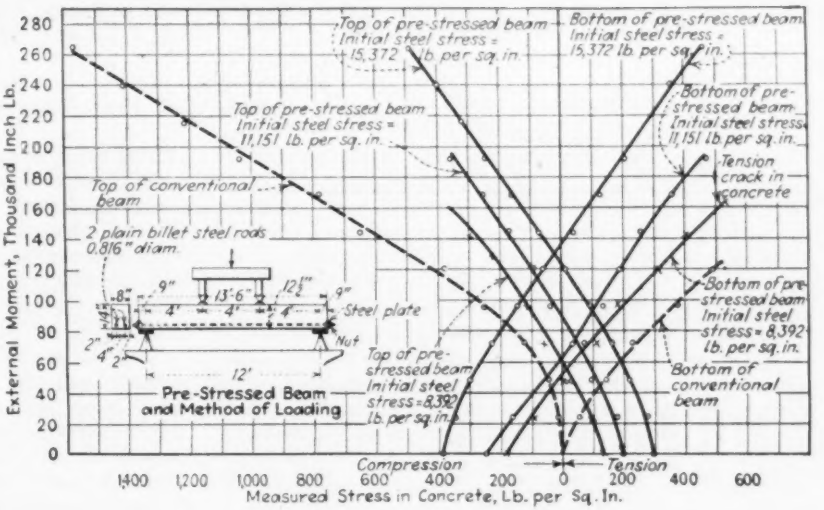
The design of the stack and foundation then resolved itself into a consideration of the moment $Pa$, the shear $P$ and the selection of the depth of embedment $H$ for a given soil pressure $f_1$ or $f_2$. The end area is to be determined for vertical load only. Hollow earth-filled footings will be found to be well adapted to this type of construction.

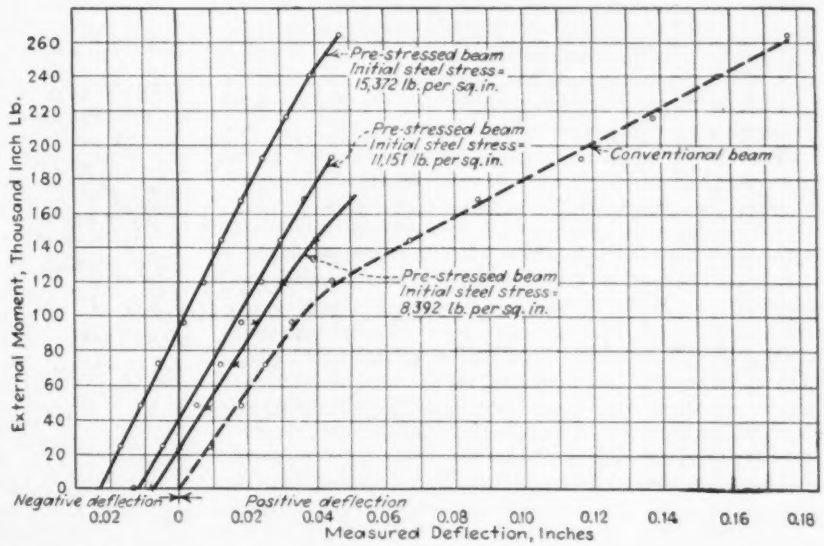
## Concrete Beam with Prestressed Bars Tested

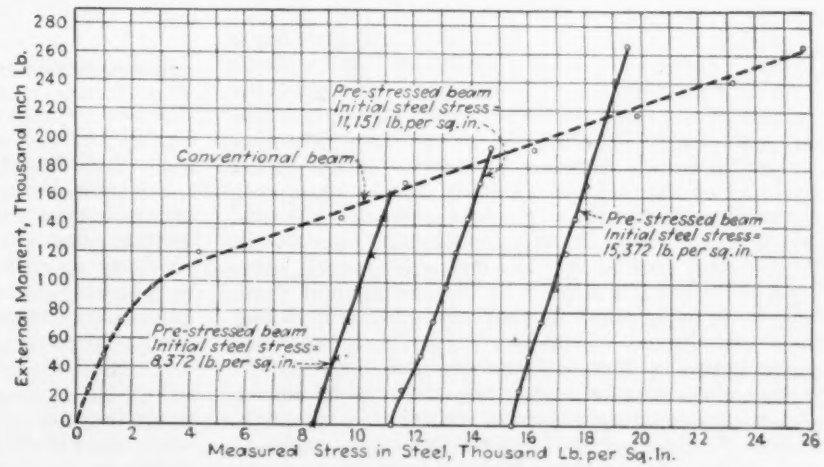
By W. K. Hatt
*Head, School of Engineering, Purdue University, Lafayette, Ind.*

ALTHOUGH the idea of destroying the bond between steel rods inserted in concrete, and prestressing the rods in tension and the concrete in compression, is not new, additional data on this type of construction has been supplied by some recent tests at Purdue University involving exact measurements on the comparative behavior of (1) a reinforced-concrete beam with adhesive bond between the steel and concrete, and (2) a beam of the same design with the bond destroyed. One advantage of the prestressing is to postpone the formation of cracks, and thus to increase the service of the beam in this respect. In making the test beams at Purdue, the reinforcing rods were prestressed after the bond between the rod and the concrete had been destroyed with an asphalt coating, resulting also in prestressing the concrete in the lower face in compression and the concrete in the upper face in tension.

The test data are given on the accompanying charts. One shows the concrete stresses in relation to external moments for three amounts of steel prestressing compared to bonded steel, another gives the relation of deflection in the two types of beams, and the third presents the relation of the steel stresses. Evidently a prestress of 8,392 lb. per sq.in. is of less advantage than the higher stress of 15,372 lb. per sq.in. when a compressive stress of 386 lb. per sq.in. was produced in the concrete of the lower face of the beam, and a tensile stress of 296 in the upper face. At the prestress of 15,372 no tension crack was observed at a moment of 264,000 in.-lb., whereas a tension crack was observed at a moment of 120,000 in.-lb. in the case of the beam with bonded steel.


External Moment, Thousand Inch Lb.
Top of pre-stressed beam Initial steel stress = 15,372 lb. per sq. in.
Bottom of pre-stressed beam Initial steel stress = 15,372 lb. per sq. in.
Top of pre-stressed beam Initial steel stress = 11,151 lb. per sq. in.
Bottom of pre-stressed beam Initial steel stress = 11,151 lb. per sq. in.
Tension crack in concrete
Top of conventional beam
2 plain billet steel rods 0.816" diam.
Steel plate
Nut
Pre-Stressed Beam and Method of Loading
Top of pre-stressed beam Initial steel stress = 8,392 lb. per sq. in.
Bottom of pre-stressed beam Initial steel stress = 8,392 lb. per sq. in.
Bottom of conventional beam
Compression
Tension
Measured Stress in Concrete, Lb. per Sq. In.


External Moment, Thousand Inch Lb.
Pre-stressed beam Initial steel stress = 15,372 lb. per sq. in.
Pre-stressed beam Initial steel stress = 11,151 lb. per sq. in.
Conventional beam
Pre-stressed beam Initial steel stress = 8,392 lb. per sq. in.
Negative deflection
Positive deflection
Measured Deflection, Inches


External Moment, Thousand Inch Lb.
Pre-stressed beam Initial steel stress = 11,151 lb. per sq. in.
Conventional beam
Pre-stressed beam Initial steel stress = 15,372 lb. per sq. in.
Pre-stressed beam Initial steel stress = 8,372 lb. per sq. in.
Measured Stress in Steel, Thousand Lb. per Sq. In.

**COMPARISONS between a prestressed reinforced-concrete beam and a conventional beam as to concrete stresses, deflections and steel stresses.**

# ENGINEERING NEWS-RECORD

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September 13, 1934


## *Stability and Initative*

SUMMER'S END brings the time that has been looked forward to as a period of economic revival. Despite the discouragements of recent months—the great drought, widespread strikes and progressive disintegration of the NRA structure—the present outlook has elements of promise. One of these is the exceptional stability of construction, whose significance we recently discussed. That stability promises to be maintained well into next year, and will continue to be a supporting force. Public construction holds at the level fixed by the sustained momentum of PWA contracts, a strongly favorable influence—though it should not be forgotten that the total of federal and local construction still is far below the level of normal requirements. But further increase of public construction volume depends less on federal aid than on returning initiative of local communities, backed by the freer money market. Residential construction, lacking the full benefit of the Housing Act, is still under the handicap of an unreconstructed mortgage situation, and the building-repair campaign has yet shown little promise of strength. There remains the important field of industrial and commercial construction, and here activity is dependent on rise of general business and on the degree to which individual initiative and courageous enterprise take command of business movements. There are signs that these latter qualities are rising to new recognition, and they appear to be the most important signs of the times. They are likely to have more influence on the early future than governmental action.

## *Bars to Economies*

THE FINAL REPORT of the President's executive council upon the state of the nation cites the fact that legislation is being formulated to bring about the much needed coordination and modernization of our transportation system. Donald R. Richberg, the secretary, calls attention to the Railroad Coordinator's completed report on the handling of rail merchandise traffic and to his coming report on such subjects as terminal unification and concentration of shops. The merchandise traffic report calls for the pooling of all less-than-carload-lot freight; obviously the terminal unification and concentration of shops reports are going to call for similar pooling. But pooling and concentration will eliminate jobs in the railroad organizations, a form of economy that Congress recently forbade the railroads to make. Terminal unification also is affected by conditions beyond control of the railroads. Their competitors by truck, through the exploitation of labor, have diverted business from the railroads that may come back when the exploitation is ended, and the future volume of business to be handled through railroad terminals will depend largely on the amount of this diverted business that returns. What is needed, therefore, before the railroads can consolidate their facilities and unify their terminals to useful effect, is to have the present condition reviewed and corrected.

## *A Two-Year Success*

WITH the present week the Eighth Avenue rapid-transit subway in New York completes two years of operation by municipal forces. It has registered an outstanding success. Its traffic has grown steadily. Operation has at all times been machinelike and efficient, comparing advantageously with the two privately operated lines that compete with it. Whether the municipal rapid-transit system will in due time become a full business success cannot yet be judged, as only fragments of the total network have so far been opened to traffic. But experience has been sufficient to furnish an answer to the major question of whether public operation of a transportation line can be made successful. The record of the Eighth Avenue subway demonstrates that efficient transport operation by a public agency is possible.

## *$H_2O$+?*

MANY YEARS AGO the quality of water was judged by its physical appearance alone. Clearness was the criterion of excellence. When the germ theory of disease found acceptance it became recognized that a clear water might still be unsafe, and bacterial purity became an added requirement. More recently the presence of dissolved minerals has become an object of attack, and many communities now practice the removal of calcium, magnesium, iron and manganese compounds. Today, the water distributed for use must be attractive to the nose and tongue as well as to the eye. What will be the quality demands tomorrow? It is unlikely that consumers will ever be willing to accept water of lower quality than that to which they have grown accustomed. But will even more drastic demands for purification be made in the years to come? It is not improbable, in view of the experiences of the past, that the waterworks profession may in the future be compelled to give major consideration to purification problems that today do not exist.

## *Darkness Spells Danger*

NEW ATTENTION is focused on the long-discussed subject of highway lighting by a recent statement of the New York Motor Vehicle Commissioner in favor of better street and road lighting as a safety measure. The important point in his statement is its inclusion of road lighting, now practically unknown. Night travel is obviously desirable and important, for if roads are to be used only during daylight hours, their usefulness is unnecessarily restricted and their earning power is reduced. Moreover, night travel is growing steadily, and it is entitled to the same study in the interests of facility and safety of movement as daytime travel. Unfortunately, the technique of road lighting is still in a primitive state, and where light systems have been installed they usually throw more light into the traveler's eye than on the road surface and its hazards. But when the need for adequate lighting is once fully appreciated, practical experience is sure to develop more efficient methods. The present warning should help to bring progress in this direction.

# New Aspects of Water Studies

THAT rivers affect human necessities and wellbeing in many different ways and that all their relations are closely involved one with the other has long been recognized in the abstract. As a concrete, practical matter, however, it is virtually new knowledge. Only the events of the past few years, and particularly the recent water-project studies and the sensational drought of this summer, brought it to full recognition. Where once navigation was the sole public concern in streams, our waters now are seen to be affected with a pervasive public interest in all of their aspects.

Seven years ago, when Congress called for a comprehensive investigation of the country's streams in their relation to navigation, power, irrigation and flood control, the broad importance of water to the community received partial recognition—probably for the first time in our national history. A still broader meaning became apparent in the work of the Mississippi Valley Committee, that interesting sub-organization which the PWA established just a year ago. Some months later there followed a departmental board study of river resources and utilization problems, a summary of whose findings is given in this issue. Now the work is being carried still farther by the National Resources Board.

This new interest in water resources goes beyond the problems of rivers alone, for there has sprung up an active interest in groundwater also. The well failures of 1930-31 and of the current year, the recognition that summer streamflow is primarily a resultant of groundwater storage, and difficulties that developed in several regions in connection with groundwater used for irrigation, all have promoted this new interest in subsurface waters.

Supply for human consumption is recognized as the highest use of water. The function of streams to drain the country and to carry away its wastes is of closely related importance. Irrigation of land, navigation, flood control, power, all impinge on human requirements. Every question or condition of land use or of economic development is dependent on such water relations. The maintenance of forests and the protection of the soil on which we live is determined by the way in which water resources are dealt with.

In any consideration of these relations between water and man one may perceive that water resources—and they are inherently limited and controlled by forces beyond man's reach—are something quite beyond a merely local interest. The existence of the entire body of the nation is so thoroughly dependent upon these resources as to make them in their very nature a national asset. Consciousness of this fact is steadily evolving, though as yet it is only in vague form.

Whether and to what extent our waters will in time be acknowledged as a truly national resource, to be owned and controlled only by the people at large for their joint interest, remains to be determined by future events. For the present it is certain that water resources will henceforth receive far more detailed and thorough study than has been accorded them in the past. Both water study and water planning will continue to be important public activities, in view of their unmistakable relation to all problems of regional development. We may be confident, moreover, that the study and planning will have constructive results provided a sound and secure foundation of fact is laid down.

It is in respect to the determination of these fundamental facts that there is most immediate need for modernization of our thinking and procedure. The observation and collection of water data have always been haphazard and scattered, largely because of the failure to recognize the comprehensive bearing of all water facts upon the general welfare, and their utter lack of coordination is the serious part of the present situation.

A pertinent illustration of what this means is found in the repeated statements of the departmental board whose report we summarize this week, that it was unable to draw up definite plans or decide intelligently on the priority of improvement projects because of lack of sufficient data. The shortcoming lies not so much in the fact that not enough observations and records have been made as it does in their lack of coordination and ready availability. The same difficulty, as every engineer knows, has been felt many times before in preliminary investigations of river or other improvement projects—for in the last analysis all improvement projects are conditioned by water data. Incompleteness of data gathered, discrepancies in procedure and results, general lack of coordination, are the primary faults of the present system (or lack of system). Clearly the time is opportune for a systematic correction.

Centralization of all water-study efforts is one alternative to the present condition, but it is also one that is affected by numerous weaknesses and questionable points. Federal, state and other agencies of diversified character are engaged in water observation of one type or another, and in the most essential interests of the subject matter it is important that all these agencies be continued in action. An attempt to dismiss them from the work and center it all in one single agency would defeat the essential purpose in view.

A constructive result can be achieved, however, through coordination of all water data by means of a clearing-house, which would leave all present water study agencies undisturbed but would obtain and compile all their data and progressively coordinate methods of procedure. Dealing with the whole range of questions involved, from primitive weather observations to flow records, quality and use investigations, drought and flood hazards, such a coordinating bureau could find it possible to produce in a short period a remarkable improvement in the amount of correctness of current water knowledge. It would rapidly build up a body of knowledge capable of furnishing a secure foundation for future planning.

This is the direction of improvement that present conditions make an essential desideratum. It is in the interests of the entire community—its business and personal interests as well as its public questions. Yet, though it is a general concern, it has most immediate relation to water-supply engineers.

This particular group has perhaps the most immediate concern with the betterment of water study. Because the aspect of water use to which they give their attention is recognized as the primary claim on water resources, they are in a peculiarly favorable position to demand proper coordination of the fundamental data. Such a demand would be obviously in the public interest. The concern of waterworks engineers in the improvement of water study is so direct that its promotion may fairly be considered their obligation.

# CURRENT NEWS

## PWA Ready to Release $25,000,000 For New York Housing

THE $25,000,000 tentatively allotted by the PWA to New York City for slum clearance and construction of low-cost housing, is ready for release, according to a plan offered Sept. 10, to Mayor LaGuardia by Administrator Ickes. The proposal was delivered by the local PWA representative, Dwight L. Hoopingarner, who reported to Administrator Ickes that the mayor favored the proposal and would seek immediate action in the board of estimate.

The plan would provide for government acquisition of land which would be leased to the New York Housing Authority with option to purchase. A grant of 30 per cent in the cost of labor and material would be made by the PWA and the loan for the remainder of the financing would be made at 4 per cent, to be amortized in 45 years. The city would provide such facilities as schools, parks, streets, sewers, and would grant tax exemptions on the improvements to be provided in addition to the land. PWA and the Housing Authority would exercise joint control over the development.

**Ickes' comments**

"The release of the $25,000,000," Administrator Ickes stated, "in whole or in part, is conditioned upon prompt and satisfactory action by the Housing Authority.

"I believe these proposals pave the way toward a successful low cost housing program for New York City. We have received generous cooperation from New York authorities in approaching the highly difficult problems of housing, and I believe we are now ready to go ahead with definite action on a carefully considered basic plan."

The work already done in New York by Commissioner Post has laid the groundwork for some of the largest slum clearance projects to be undertaken in this country. Agreement has been reached, according to reports, on the Williamsburg area and the Red Hook section as possible sites, with options already taken. However, alternative areas are still under consideration to determine the most suitable basis for costs and rents.

## Double-Track Railroad Tunnel Holed Through in Baltimore

In the presence of officials and engineers of the Pennsylvania Railroad and the Arundel Corp., contractor, the 2,085-ft. double-track railroad tunnel being built in Baltimore by the railroad, was holed through September 8. This tunnel is a part of the Pennsylvania Railroad Co. improvement and electrification program, which will cost more than $22,000,000. It is located under Hoffman St., between Greenmount Ave. and Bond St.

## New Professional Society Meets With Engineering Examiners

A meeting of the newly organized National Society of Professional Engineers will be held in Portland, Ore., October 3, in connection with the annual meeting of the National Council of State Boards of Engineering Examiners. The organization of the new professional society was outlined in last week's issue, page 312.

The meeting will be presided over by J. L. Franzen, president of the Professional Engineers of Oregon. The principal speakers will be D. B. Steinman, New York City, president of the National Society of Professional Engineers, who will explain the organization and purpose of the society, and E. A. Wheatley, Vancouver, B. C., Registrar of the Association of Professional Engineers of British Columbia, who will speak on "What a national society of professional engineers can accomplish."

## Plans Have Been Approved for $2,575,000 Dam on Ohio River

Plans for a dam on the Ohio River at Apple Grove, W. Va., below Gallipolis, Ohio, have been approved by the chief of engineers and bids will be advertised about Oct. 15. According to an announcement by Major John F. Conklin, district engineer, Huntington, W. Va., there is assurance that funds will be available for the project. Two appropriations for the dam will be required, amounting to $2,575,000.

The structure as planned would be larger than the two recently completed dams at Marmet and London on the Kanawha River. The Gallipolis dam will have eight 125-ft. roller gates, compared to the five 100-ft. gates on the dams on the Kanawha River. Two of the gates on the new dam will be equipped with flaps designed to permit the passage of ice and driftwood. The twin locks at this location, with 26-ft. lifts, are under construction by the Dravo Contracting Co., Pittsburgh, and are now about 25 per cent complete.

## Illegal Listing as Engineers Checked by New York Society

As the result of a campaign inaugurated last winter to end the listing of unlicensed engineers as engineers in the New York telephone directory, the New York State Society of Professional Engineers has succeeded in reducing the number so listed from 129 in the 1933 fall-winter directory to 41 illegal listings in the fall-winter directory this year. Of the 129 requested to correct their listings, 82 have withdrawn their listings and six have secured licenses as professional engineers.

Copies of letters addressed to those who are found to be illegally listed as engineers are sent to the telephone company so that it is kept informed at all times of the society's action.

## Additional Code Explanations Issued Covering Controversial Questions

THE Construction Code Authority has issued Explanations 30 and 31 covering questions raised on interpretations of the meaning of the code.

In answer to a question as to the application of the provisions of an additional chapter of the code, the authority states, in Explanation 30, that operations undertaken in accordance with bona-fide bids made not more than sixty days prior to the effective date of the applicable chapter, but not prior to March 2, are not bound by the provisions of the particular chapter, but only by Chapter I.

A further question was raised on whether a special contractor or a subcontractor may agree with the awarding authority to perform the work required in a particular branch of the industry at a price lower than the special contractor had bid to a general contractor for this same work. Explanation 31 states that if an owner, or awarding authority, decides to do work directly for which competitive bids had been submitted by special contractors or subcontractors to general contractors, these sub-bids are automatically rejected. The owner is then free to obtain new prices from sub-contractors, subject, however, to the restrictions imposed by the code as to asking bids for substantially the same work previous to the lapse of ninety days from the date of such rejection and the provisions of divisional chapters restricting the alteration of bid price of members of such division.

The question was raised on the intent of Section 7 of Article VII stating that subcontractors shall deliver their bids to the general contractor before noon on the preceding Saturday (in this particular case bids were to be received by noon on Monday). The point at issue was the possibility of delivery up to Sunday noon. The same question arises when the time set for the receipt of general contract bids by the awarding authority is on a day following a holiday. The interpretation approved by NRA Division Administrator George L. Berry states that the intention of Section 7, Article VII of Chapter I, competitive bidding practices, is to fix a definite time prior to the delivery of the general contractor's bid to the awarding authority beyond which subcontract bids may not be submitted, and the general contractor thus has a reasonable period in which to analyze such sub-bids and to assemble his general bid. If this period terminates on Sunday or a holiday, the general contractor's office would not have the minimum 24-hr. period necessary, since business is customarily not conducted on Sunday or a holiday. Therefore, in figuring the minimum period of 24 hr., Sundays and legal holidays shall be excluded.

# Contractors Discuss Bid Depository Plan At Chicago Meeting

DEVOTING its sessions to a discussion of the many details of code administration including the plan for bid depositories, the General Contractors' Divisional Code Authority, on Sept. 5 and 6, at Chicago, held its first sectional meeting with the representatives of twelve state administrative agencies. The states officially represented included Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, Ohio, South Dakota and Wisconsin.

Views were exchanged and constructive comment developed in the direction of better and more rapid coordination between the divisional authority and its state agencies. Many problems were analyzed in detail from different points of view and it became clear that improvement in code administration can be best expedited by close contact made possible through general open meetings.

### Bid depositories

The discussions included a thorough analysis of the proposed plan for the establishment and operation of bid depositories for general contractors. The purpose of this plan is to establish a basic procedure which can be made applicable in all cases where bid depositories are needed, with necessary amplification wherever local conditions require. The plan was considered in its relation to the three proposed sub-chapters of Chapter II of the construction code now awaiting approval by NRA, and if there is no conflict between their provisions and those of the basic bid depository plan, the program will immediately be put into final form for approval by the construction code authority.

Although it was made clear that the divisional authority, as such, is not specifically concerned with the question of area agreements on hours and wages, inasmuch as such agreements are to be made through collective bargaining by truly representative groups of employers and employees, stress was laid upon the necessity of keeping close watch on proposed agreements and of attending any hearings held on these agreements. Nick F. Helmers, St. Paul, a member of the divisional code authority and president of the A.G.C., gave the authority a comprehensive outline of the activity of this association in developing satisfactory industrial relations under this phase of the code.

### Agencies organized

Executive Manager Louis W. Hickey reported that state administrative agencies of the divisional code authority have been appointed, organized and are functioning in all of the states except Mississippi, Montana and North Dakota. He also reported that the executive office of the divisional authority at Washington is forwarding NRA labor posters to every general contractor of record in the United States and at an early date will mail additional posters to each state agency and its sub-agencies. Posters have already been sent to about 15,000 general contractors, he reported.

Thirteen requests for exemptions from the hour provisions of the code have been received by the authority and forwarded for consideration to the National Planning and Adjustment Board. Six of these are still pending; five have been granted; (*ENR*, Sept. 6, 1934, p. 314) and two definitely denied.

The divisional code authority also received and considered a report submitted by the special joint committee appointed to clarify the relations between the general contractors' and mason contractors' divisional code authorities, but withheld announcement of any action that it may have taken.

## Several Large-Scale Projects Planned in Eastern Canada

Construction of a highway from Mont Laurier to the Abitibi region in Northern Quebec, which would provide direct highway access from Montreal to the steadily developing mining region is being actively discussed as an unemployment relief measure. The project would involve the expenditure of about $20,000,000.

The town of Laval des Rapides on the Isle Jesu, lying immediately north of the Island of Montreal, has requested the Montreal Water Board for a supply of water from the municipal system. The delivery would be through a 36 in. main to be built at a cost of $150,000. This main would supply a newly developed section of Montreal and several adjoining communities.

More than $80,000 has been spent by the Metropolitan Commission of Montreal on preliminary work for the long proposed Trans-Island Boulevard which is to extend from one end of the island to the other, by-passing the main part of the city and the water front municipalities. Although this sum has been spent on plans for the project, the program for construction remains indefinite.

## Majority of 6 to 1 voted for $1,224,000 Water Project

By a majority of 4,759 to 755, the voters of Eureka, Calif., overwhelmingly approved a municipal water development program estimated to cost $1,224,000. The proposal on the August 31 ballot provided for bonding the city for $906,000. These bonds will be taken up by the PWA on an allotment already approved and the remainder of the financing will be in the form of a $318,000 grant. The project will provide for a storage dam on the Mad River and a 23-mile pipe line to the city.

Last December the voters approved the same project by a 6 to 1 vote, but the revenue-bond type of financing provided by that proposal was not acceptable to the PWA, which insisted on a general obligation bond, and this necessitated the second election.

## Dredging Contract Awarded For Port of Brownsville, Texas

Contract has been awarded for the dredging of about 17,500,000 cu.yd. of material for a ship channel and turning basin, as part of the new port and harbor development work of the Brownsville navigation district, Brownsville, Texas. Contract was let to the Atlantic, Gulf and Pacific Dredging Co., New York, on a bid of $1,485,903.

Specifications call for dredging a 25-ft. channel with a 100 ft. bottom width, from the Port Isabel channel to a point about 7 miles from Brownsville, a distance of 14.5 miles. At the terminal of this dredged channel, a turning basin 1,000x 1,300 ft. will be dredged to a depth of 25 ft.

The project is to be financed through funds contributed by the navigation district obtained from the sale of $2,470,000 bonds to the PWA.

## WORK BEGUN ON DEMOLITION OF WATERLOO BRIDGE, LONDON

**Demolition of the famous bridge over the Thames River at London has begun after long controversy as to whether it should be rebuilt or entirely removed. The bridge has long been considered a serious obstruction to Thames River traffic. Demolition is expected to take many months as the arches must be taken down simultaneously to prevent collapse and overturning of the piers.**

## Elevated Rail Loop Terminal For San Francisco Bay Bridge

Plans for handling electric interurban train traffic on the San Francisco-Oakland Bay Bridge, announced Sept. 6 by C. H. Purcell, chief engineer, provide for an elevated rail loop leading off the San Francisco bridge head to a five-track loading platform 24 ft. above street level. The loop terminal will center at First St., between Mission and Howard; the loading platforms will be 780 ft. long connecting with street level by ramps and stairways.

"Through" interurban service is planned, i.e., commuters will board trains at the usual points in East Bay cities and these same trains will cross the bridge, discharge passengers on the San Francisco loop and continue around the loop back to the bridge. Westbound vehicular traffic will continue down the main approach to reach street level at Fifth and Harrison Sts. Vehicular traffic will have a maximum grade of 4 per cent except on off ramps where 6 per cent will be the maximum. The maximum track grade will be 3 per cent.

The interurban traffic plan is designed to come within the $15,000,000 which is understood to be the maximum that can be obtained from RFC in addition to the $56,000,000 which will be the cost of the bridge equipped for vehicular traffic only. In the original negotiations the RFC set a top limit of $61,400,000 (for vehicular traffic only) but actual costs have been lower, the figure now is set at $56,000,000.

It is planned to spend the $15,000,000 for interurban facilities as follows: $6,500,000 to cover viaducts, station building and property in San Francisco; $8,500,000 for tracks and other facilities on the bridge, an Oakland storage yard, track relocation and rolling stock.

The San Francisco Toll Bridge Authority will own the equipment which will be operated under a lease agreement with the Key System and the Southern Pacific. These two companies are expected to effect a merger of commutation service with the Key System as the operating unit with which the Bay Bridge Authority will deal.

## Metropolitan Water District Announces Tax Levy of $1,540,000

The levy on the thirteen member cities of the Metropolitan Water District of Southern California for the current year has been announced by the district board of directors at a sum not to exceed $1,540,000, with optional payments either from general city revenues, such as water earnings, or by taxation. The funds will be used by the district for operating costs and for payment of interest on outstanding Colorado River aqueduct bonds. About $775,000 in the district's reserve fund was authorized by the board for bond interest and other payments accrued during 1934-35, to reduce the amount of taxes.

If each member city pays its share of the levy through taxation, the levy will not exceed 10c. on each $100 of assessed valuation, according to the board. More than $10,000,000 has thus far been distributed by the district to persons employed on the aqueduct project, and more than 4,500 men are now employed directly on the project.

# Pacific Coast Engineering Progress

### Large volume of engineering work under way —Major projects preponderate—Work ahead of schedule—Rumors and unrest current

*(Special Correspondence)*

SAN FRANCISCO, Sept. 6.—Summarizing expenditures on large projects now under way in far Western states gives an enormous total. Federal aid plays a major role in these figures. Most jobs are ahead of schedule; all are progressing rapidly. Success of contractors on Boulder Dam (Six Companies, Inc.) is attested by their recent bidding on numerous other jobs. Latest contract awarded them is for Parker Dam, 340 ft. high, on Colorado River (contract price $4,239,834) to divert water into the Metropolitan Water District aqueduct. Other Colorado River aqueduct activities include recent call for bids to be opened Oct. 3 for $35,000,000 of work, including 14 miles of siphons, 34 miles of covered conduit and 62 miles of lined canals. Concrete will be used along all this 110 miles of additional aqueduct work, which will require four years to complete.

The San Francisco-Oakland bridge, expected to be finished six months ahead of schedule, has the major difficulties of foundation safely overcome; two of its steel towers are practically completed. The Golden Gate Bridge, with its unprecedented span of 4,200 ft., is behind schedule because of delays on the south pier, but with the pier fender ring base now completed, uninterrupted progress henceforth is expected.

#### Earthquake-resistant design

Structural engineers throughout California are busy analyzing stresses and planning the strengthening of public buildings, particularly schools, under the new state law requiring earthquake-resistant construction. California state highway work maintains a high level of activity through the annual income of $30,000,000 from the 3-cent state gas tax. Highway work includes several new routes, notable bridge structures and road improvement to fit in with local projects. A notably large local improvement is the Broadway low-level tunnel being built by a joint county organization to provide a short cut from Oakland through the Berkeley hills. This $3,500,000 project is a twin bore vehicular tunnel. Each tunnel will be 22 ft. wide and 3,000 ft. long; elaborate ventilation equipment and extremely heavy approach cuts are involved. California's $170,000,000 Central Valley water conservation plan still looms as a possibility which would provide much engineering work and would materially change the irrigation picture of the state. Whether federal funds will be available for starting this project has not been settled.

#### San Francisco garbage

San Francisco supervisors continue the almost perennial wrangle over city garbage disposal. The present fill-and-cover disposal just south of the city boundary probably will be moved 5 miles farther south, where the fill can be made on the city's own property at the Municipal Airport. Railroad freight to the present disposal site is 20c. per ton, compared to 3c. per ton for delivery by barge to the airport.

Federal allocation of an additional $1,200,000 to the Bonneville project for increasing the size of the navigation lock has added to the engineering activity there. Throughout the Columbia River valley interest has focused on the Grand Coulee project since President Roosevelt's outspoken preference for the high dam. Rumor has it that this may mean early work on the Columbia Basin irrigation project, Grand Coulee power to be used for pumping.

## Time Extension on Power Project Refused by Power Commission

The Federal Power Commission has notified the Rocky Mountain Power Co. that it will not grant any further extension of time for the completion of construction of its Flathead power project in Montana. The project is located on the Flathead River below Flathead Lake near Polson, Montana. It was planned to develop 80,000 hp. of primary power and to install 150,000 hp. of power equipment ultimately. The original license was issued in May, 1930 for a period of 50 years and, subsequently, construction work on the project was begun but was abandoned on account of financial conditions. In May, 1933, the company applied for an indefinite extension which was objected to by the Secretary of the Interior because of its effect upon the rentals to be paid to the Flathead Indians. Rentals of $1,000 a month were to be paid during the construction period and were to be increased to $5,000 a month after the plant was completed. The commission's action in refusing to approve a further extension was taken upon advice from the Secretary that he would not approve a further extension because the power company would not accept the conditions set up. As a result, the license for the project was put in default on Aug. 24.

## State Hearing on Water Rights For Casper-Alcova Project

A hearing will be held in Cheyenne, Wyo., before the state engineer, on the application of the Bureau of Reclamation for permit to appropriate water from the North Platte River to the Casper Canal, a part of the Casper-Alcova project now under construction.

The federal application for the water for the Casper Canal, filed in 1904, has been dormant in the state engineer's office since that time, and it is the plan of the bureau to have the water rights date from the filing of the original application to protect the federal development from subsequent filings. This procedure has been used in other cases of water rights for projects carried out by the bureau.

The formal hearing necessary for the issuing of the permit is generally looked upon as a perfunctory step. However, irrigators on the Platte River and tributaries, who have water rights subsequent to 1904, are reported to oppose the early date on the federal application.

## Flood Control Engineer to be Named from List of Ten

The new chief engineer of the Los Angeles County Flood Control District will be selected by the board of supervisors from a list of ten names it has requested to be submitted by the American Society of Civil Engineers. The position was left open by the resignation of E. C. Eaton, chief engineer for the last seven years, which was announced last week (*ENR*, Sept. 6, 1934, page 312).

Samuel M. Fisher, office engineer, and connected with the flood control district in various capacities for a number of years, has been appointed acting chief engineer in the interim. The motion of the board of supervisors appointing Mr. Fisher carried the provision for naming a permanent successor from the list to be prepared by the Am.Soc.C.E. The acting chief engineer will work under the general direction of the consulting board for the district, composed of L. C. Hill, Rush T. Sill, C. F. Tolman and George Elliott.

## St. Louis to Spend $250,000 for Mississippi Bridge Maintenance

St. Louis will spend $250,000 to complete the painting and repairing of the Municipal Bridge across the Mississippi River between St. Louis and East St. Louis, Ill. The work of repairing the bridge started last October and to date $59,072.58 has been expended. The entire program will not be finished before the end of 1935. The mayor has been advised by city engineers that previous city administrations had failed to properly maintain the bridge and this deferring of maintenance is now proving costly to the city. The mayor said that he was told the bridge had not been painted since it was built seventeen years ago.

## Settlement of Buildings Attributed to Drought

Settling houses in one section of Council Bluffs, Iowa, after the buildings had stood for several decades without damage, is attributed, according to reports, to the long continued drying out of the clay foundation material as the result of the continued drought. The problem is being studied, although the condition of the houses is not serious and there is no indication that the buildings will have to be condemned.

## Sewage Disposal Problem of Pawtucket, R. I., Up for Review

A study of the broad problem of sewage disposal at Pawtucket, R. I., by a special commission has been recommended by the joint council committee on sewers in a report to the state board of purification of waters. The committee favors completing the present plan for lateral sewer construction at an ultimate cost of about $500,000 and holding in abeyance the building of the proposed sewage treatment plant at Bishops Bend. It is hoped that government funds may become available for the lateral work, at least in part. In its report the committee contended that considerable pollution of the Blackstone River is caused by industrial wastes that enter the watershed both within and outside the city.

## Construction Code Officials Confer With Regional Agencies

During the past week, two officials of the construction code made trips into several states with relation to operating conditions under the code. Sullivan W. Jones, Chairman of the National Construction Planning and Adjustment Board, was in New England to confer with members of the industry and code administrative officials in Boston, Worcester and other cities. His visit was concerned primarily with the different skilled labor rates where fixed under the several chapters of the code. J. W. Follin, secretary of the Construction Code Authority, met with the temporary coordinating committees designated by the authority in Detroit, Cleveland and Pittsburgh, and conferred with code administrative officials. These meetings were held primarily to secure the recommendations of these cross-sectional industry committees as to the possibilities of further coordinating or consolidating the field administrative agencies. NRA has requested a report on this subject from the authority.

At the meeting of the executive committee of the construction code authority which will be held in Washington on Sept. 13, a committee will be designated to investigate fully the possibilities of consolidation and coordination of administration under the code. Already many steps have been taken by various divisions of the industry in the direction of coordination for more effective administration. In several cities central bid depositories are in operation, or are in process of being established, while other administrative facilities are being supplied through central offices and concentrated personnel. It was recently announced that the regional administrative agency for the Painting, Paperhanging and Decorating Division will be coordinated with and administered through the same offices as the West Virginia State Agency for General Contractors.

Chapter XXII, of the construction code, covering the building granite division, has been approved and becomes effective on Sept. 19.

## Railway Trestles Being Built Across Bonnet Carre Spillway

Construction operations are well under way on the three railroad trestles which will span the Bonnet Carre Spillway, a feature of the Mississippi River flood control program, near New Orleans. Completion of the structures is planned for the spring of 1935.

On the structure being built by the Illinois Central Railroad, the earthwork approach, which starts at the guide levees of the spillway, has been completed on both sides and pile-driving for the trestle and construction of the concrete piers for the girder span has started. This crossing will be about 3½ miles long, situated near the lake end of the spillway near its maximum width.

Creosoted piling is delivered on an existing spur track, which parallels the approach grade, and unloaded by crane. The piles range from 70 to 90 ft. long and the elevation of rail on the ballasted deck will be about 19 ft. above ground. The crossing will also include some 35-ft. and 70-ft. steel girder spans. Most of these will be located on the northern side of the spillway which will carry the majority of the flow. Foundations for these spans consist of concrete piers resting on timber piles.

The accompanying illustration shows pile-driving operations under way and the first concrete fire-stop on this trestle.

Earth-filling operations on the Yazoo and Mississippi Valley Railroad, a subsidiary of the Illinois Central, has been started and the driving of piles within the spillway area proper will be undertaken as soon as the approach grade has been completed. On the crossing being build by the Louisiana and Arkansas Railroad, the first approach work has been completed and pile-driving for the trestle has been started.

**TRESTLE TO SPAN BONNET CARRE**

**Work on the timber trestle being built by the Illinois Central Railroad across the Bonnet Carre Spillway near New Orleans. The piling varies from 70 to 90 ft. in length; the base of rail in the ballasted deck structure will be about 19 ft. above normal ground line.**

## *Brief News*

SPECIFICATIONS for an extention to the south jetty at the mouth of the Fraser River in British Columbia have been completed by the district engineer of the Canadian Department of Public Works and are being reviewed in Ottawa. The work involves the construction of about 8,000 ft. of jetty at an estimated cost of $280,000.

RIPRAPPING of the banks of Cherry Creek in Denver, Colo. is under way with about 150 men employed. When this work progresses to the junction with the Platte River, the operations and crew will be expanded. In the past, Cherry Creek has produced some severe local floods.

BRICKLAYERS and associated workers will continue to accept the wage scale of $1 per hour at Utica, N. Y., instead of the $1.25 as had been requested. The settlement was made by an arbitration committee and the unions agreed to the continuation of the lower rate in the expectation that building activities will be increased.

PWA BUILDING ACTIVITY in some Oklahoma towns has been delayed because of the local banks' failure to accept deposits of PWA funds on which 2 per cent interest is required.

IMPROVEMENTS to the state airport in Hillsboro, R. I., estimated to cost $450,000, have been approved by the Emergency Public Works Commission in that state. The work will include the construction of concrete runways, grading of the entire field, and the building of a drainage system.

TAXPAYERS OF BROCTON, N. Y. have passed a resolution authorizing the expenditure of $2,000 for plans for a new sewer system and disposal plant estimated to cost about $134,000.

INITIAL STEPS have been taken in Jamestown, N. Y. to form a local organization of engineers to affiliate with the American Society of Swedish Engineers of New York and the Swedish Engineers Club of Chicago.

WORK HAS STARTED on the new $529,000 Ontario Street storm drain, Buffalo, N. Y., as an emergency relief project. This constitutes the second half of a $1,328,000 sewage project program for later enlargement into a complete new system of sewers and disposal plant to cost $17,000,000.

FORMAL ACCEPTANCE has been made by the city commission of Dallas, Texas, of all conditions required for the construction of a triple underpass, and bids for the three-way grade separation, to cost about $1,000,000, were received by the State Highway Commission at Austin up to Sept. 11. Under the agreement the city will pay all costs above $537,000, the remainder to be paid by the state.

DREDGING of the Niagara River between Tonawanda and Niagara Falls, N. Y. by the Great Lakes Dredge & Dock Co., to provide a 12-ft. depth for barges, has been completed, with the exception of the removal of a few boulders. Barges can now proceed directly from Tonawanda to Niagara Falls.

A MEASURE, sponsored by architects of Louisville, Ky. would require all persons filing plans in the building inspector's office of that city to have an architect's license. The plan is opposed by the mayor, according to reports, as he does not believe the city has a right to specify who shall file building plans.

# PWA Allocates $5,000,000 More for Erosion Control

AN allotment of $5,000,000 to continue the soil erosion control work undertaken by the federal government in cooperation with local interests was announced recently by Administrator Ickes. The new allotment supplements previous PWA funds for the Soil Erosion Service of the Department of the Interior to carry on conservation work preventing loss of valuable top soil through wind and water erosion throughout the country.

This conservation work was undertaken last year with an original PWA allotment of $10,000,000. After viewing the accomplishments of the soil erosion program the special board of public works decided results achieved in combatting erosion warranted carrying the work further. With the money, H. H. Bennett, director of the Soil Erosion Service, plans to expand the erosion control program to include a number of new projects in various sections of the country. Tentative plans for expenditure of the new grant call for the probable establishment of new erosion control projects in Arizona, Colorado, Minnesota, South Dakota, Kentucky, and other states where the ravages of wind and rain are stripping fertile farm land of its vital top soil.

### Non-federal PWA allotments

Allotments by the PWA for non-federal projects continue as fast as additional funds become available through rescissions, reductions in loans and requests from municipalities for changes from loan-and-grants to straight grants. Further, the operations of the RFC in disposing of bonds held by the PWA have begun, which adds to the revolving-fund operation of the PWA finances.

The last list of non-federal allotments announced by the PWA follows:

KEY TO SYMBOLS

| | |
|---|---|
| *-grant | |
| m-meters | c-canal |
| p-pump | dm-dam |
| t-tank or standpipe | r-reservoir |
| f-filtration | t-treatment plant |
| d-distr. supt. | b-building |
| w-well | i-iron removal |
| s-supply | pw-power line |
| g-generator | sf-softening |
| ch-chlorinators | bl-boilers |

### Water Works

| | |
|---|---|
| Deland, Ill., w-p-t-d | $33,000 |
| Escanaba, Mich., d | 39,000 |
| Escanaba, Mich., s | 20,000 |
| Escanaba, Mich. (manholes) | 4,500 |
| Estancia, N. Mex., w-p | 2,000 |
| (In detail description section of PWA official release this is listed Escanaba, Mich., same allotment number). | |
| Jamestown, Ohio, w-p-t-d | 58,000 |
| Jewett, Tex., w-p-r-t-d | 29,000 |
| Junction, Tex., w-t-repairs-d | 8,500 |
| Lousiana, Mo., s-f-r-d | 300,000 |
| Reynoldsburg, Ohio, w-p-t-d | 42,000 |
| Skiatook, Okla., s | 93,000 |
| Thornton, Tex., w-p-t-d (also sewers and disposal plant) | 59,000 |
| *Valparaiso, Ind., t-d | 27,000 |
| Warrior, Ala., w-p-tr-t-d | 38,000 |

### Sewers & Disposal Plants

| | |
|---|---|
| *Antioch, Ill., p | 1,400 |
| Ardmore, Okla. | 45,000 |
| *Byesville, Ohio | 50,000 |
| Lone Oak, Tex. | 25,000 |
| Mount Calm, Tex. | 19,000 |
| St. Clair, Mo. | 45,000 |
| Thornton, Tex. (see Waterworks) | |

### Street or Road Const.

| | |
|---|---|
| *Cleveland, Ohio (Hamm Ave.) | 9,000 |
| Enfield, Conn. | 206,000 |
| Parkside, Pa. (Delaware Co.) | 69,500 |
| *Tomahawk, Wis. | 6,100 |

### Bridges

| | |
|---|---|
| Columbus, Ohio | 482,000 |
| Hanover, N. H. | 82,000 |
| Norwich, Vt. | 11,700 |

### Power Plant & Equipment

| | |
|---|---|
| Farmington, Mo. (Diesel) | 141,000 |
| Murray City, Utah (Diesel) | 33,000 |
| Navajo Co., Ariz. (irrigation and hydro-electric power plant) | 148,000 |

### Buildings

| | |
|---|---|
| *Commonwealth of Mass. (shop building, Gardner State Colony) | 14,000 |
| Des Moines, Iowa (club house) | 22,000 |
| Escanaba, Mich. (repairs) | 1,100 |
| Gadsden, Ala. (community recreation) | 136,000 |
| *Gastonia, N. C. (hospital) | 22,800 |
| *Leon County, Fla. (armory) | 18,000 |
| *Minneapolis, Minn. (armory) | 185,500 |
| New York, N. Y. (city home, Welfare Island) | 97,400 |
| New York, N. Y. (health center) | 214,000 |
| New York, N. Y. (hospitals) | 312,670 |
| Wayne County, Mich. (hospital service bldgs.) | 905,000 |
| Wayne County, Mich. (vocational bldg. and power house) | 209,600 |

### Schools

| | |
|---|---|
| Edwardsville, Madison Co., Ill. | 8,600 |
| Hartford, N. Y. (Washington Co.) | 83,500 |
| Hooper, Colo. (Alamosa and Saguache Cos.) | 8,000 |
| Laredo, Tex. | 304,000 |
| New York, N. Y. (gymnasium equipment) | 65,800 |
| New York, N. Y. (108th Ave. and 156th St., Queens) | 384,100 |
| New York, N. Y. (Tottenville) | 977,000 |
| *Park County, Colo. (Fairplay) | 7,500 |
| St. Edward, Neb. | 28,200 |
| Washington, N. D. | 5,500 |

### Miscellaneous

| | |
|---|---|
| Electra, Tex. (stadium) | 6,800 |
| Escanaba, Mich. (tennis courts) | 1,700 |
| New York, N. Y. (rapid transit railroad improvs.) | 391,300 |
| New York, N. Y. (subway ventilators) | 326,000 |
| New York, N. Y. (wiring for college) | 84,000 |
| Yonkers, N. Y. (heating equipment) | 9,000 |

**Forthcoming tabulations of PWA allotments for non-federal projects will be printed in the Business News section under CONSTRUCTION REPORTS.**

## SOCIETY CALENDAR

AMERICAN SOCIETY OF MUNICIPAL ENGINEERS, annual meeting, Rochester, N. Y., September 24-28.

INTERNATIONAL ASSOCIATION OF PUBLIC WORKS OFFICIALS, annual meeting, Rochester, N. Y., September 24-28.

NATIONAL COUNCIL OF STATE BOARDS OF ENGINEERING EXAMINERS, annual meeting, Portland, Ore., Oct. 3-5.

NATIONAL SAFETY COUNCIL, annual meeting, Cleveland, Ohio, Oct. 1-5.

AMERICAN WELDING SOCIETY, fourteenth fall meeting, New York City, Oct. 1-5.

INTERNATIONAL CITY MANAGERS ASSOCIATION, annual conference, St. Louis, Oct. 15-17.

AMERICAN ROAD BUILDERS, annual convention, Washington, D. C., Jan. 22-25.

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NEW ENGLAND WATER WORKS ASSOCIATION, annual fall convention, Boston, Mass., Sept. 18-21.

NEW YORK SECTION, AMERICAN WATER WORKS ASSOCIATION, fall meeting, Buffalo, Oct. 11-12.

WISCONSIN SECTION, AMERICAN WATER WORKS ASSOCIATION, annual meeting, Wausau, Sept. 24-26.

MISSOURI WATER AND SEWERAGE CONFERENCE, tenth annual meeting, Carthage, Mo., Oct. 15-16.

NEW YORK STATE SEWAGE WORKS ASSOCIATION, fall meeting, Oneonta, Oct. 5-6.

HIGHWAY RESEARCH BOARD, annual meeting, Washington, D. C., Dec. 6-7.

## Personals

T. MONDAL, for several years on the designing staff of the W. S. Lee Engineering Corp., Charlotte, N. C., has been appointed associate hydraulic engineer with the TVA at Knoxville.

FRANCIS L. STEEL, New Madrid, Mo., has been appointed to serve as county surveyor and ex-officio engineer for New Madrid County to fill out the unexpired term of Maurice Thompson, recently resigned.

WILLIAM W. LEWIS, assistant engineer of the Boston Transit Department, retired Sept. 1 after 40 years of service in the department, including work on all subway and tunnel construction in the city, dating from the Tremont Street underground route to the latest developments being made to the Rapid Transit System.

FRANK W. WEBSTER, state highway commissioner of Tennessee, has resigned to join the staff of the TVA as an executive in the highway construction program.

## Obituary

JOHN FRANKLIN RYAN, retired construction engineer, died at his home in Greenwich, Conn., Sept. 3 at the age of 72.

A. W. BOWIE, for 25 years construction engineer for the firm of Westinghouse, Church & Kerr Co., New York City, died in Binghamton, N. Y., Sept. 9, age 56.

WILLIAM A. FAULON, 67, an engineer who had supervised the construction of a large amount of harbor improvement work along the south shore of Long Island, died at Edgemere, L. I., N. Y., Sept. 1.

WILLIAM B. EELLS, for many years engineer in charge of survey work on the Toledo & Ohio Central Railway, later a part of the New York Central System, died at his home in Mt. Gilead at the age of 85. He had retired from active engineering work several years ago.

ARTHUR G. EMERSON, for many years superintendent of streets in Reading, Mass., and for the past 25 years in charge of the Blue Hill reservation of the Metropolitan District Commission near Boston, died at his home in Milton, Mass., on Sept. 9 at the age of 79.

HENRY STANYON, president of the S. & H. Engineering Co., Montreal, Quebec, died in that city August 25, at the age of 71. A native of England, Mr. Stanyon was a graduate of Duquesne College in Pittsburgh. He had been president of the Montreal company for eight years prior to his death.

IRVING C. RUTLEDGE, superintendent of highway construction for the S. B. Ziegler Construction Co., died in Memphis, Tenn., Sept. 1. He had been associated with the construction company for 15 years and was engaged in supervising highway work near Memphis for the organization.

WILLIAM M. JAEKLE, engineer of maintenance-of-way and structures, Southern Pacific R.R., died in the company hospital in San Francisco, Sept. 3, at the age of 60. He was a veteran of 30 years service with the company, entering its employ in the engineering department on the Sacramento division.

# CONSTRUCTION STATISTICS OF THE WEEK

ENGINEERING awards at $20,317,000 are higher than last week but below the average week for this year to date, $24,270,000. Both federal and state and municipal public works are down, the former to $2,842,000 and the latter to $12,801,000. Private work is higher, $4,674,000.

Highway awards at $3,557,000 continue low. The fall work is getting under way, however, with a number of lettings scheduled for this week. Sewerage is low for the week at $743,000 as are the awards for earthwork, irrigation, drainage, waterways $986,000, and industrial buildings at $588,000. Bridge awards at $2,503,000 are almost 50 per cent higher than last week as also are waterworks at $1,524,000. Public building awards increased from $3,200,000 last week to $6,038,000 this week and commercial buildings from $117,000 to $2,853,000 this week.

The larger contracts include: elementary schools, Bradford, Pa., $600,000, Buffalo-Kensington High School, New York, $746,000; highway letting by Utah, $518,000; grade crossing elimination by Erie R.R., Elmira, N. Y., $568,000; water softener plant and equipment, Hamilton, O., $425,000; and pier by Gulfport Port Commission, Gulfport, Miss., $972,000.

New capital for the week includes $10,056,000 in state and municipal bond sales and net increases in PWA allotments for non-federal work of $4,343,000.

### CONTRACTS
(Thousands of Dollars)

| | Weekly Average Week Sept. 1933 | Prev. 4 Weeks | Sept. 13 1934 |
|---|---|---|---|
| Federal Government | $6,020 | $7,026 | $2,842 |
| State and municipal | 12,413 | 11,760 | 12,801 |
| Total public | $18,433 | $18,786 | $15,643 |
| Total private | 8,236 | 4,578 | 4,674 |
| Week's total | $26,669 | $23,364 | $20,317 |

Cumulative to date:
1933.....$604,844 1934....$897,978

### NEW PRODUCTIVE CAPITAL
(Thousands of Dollars)

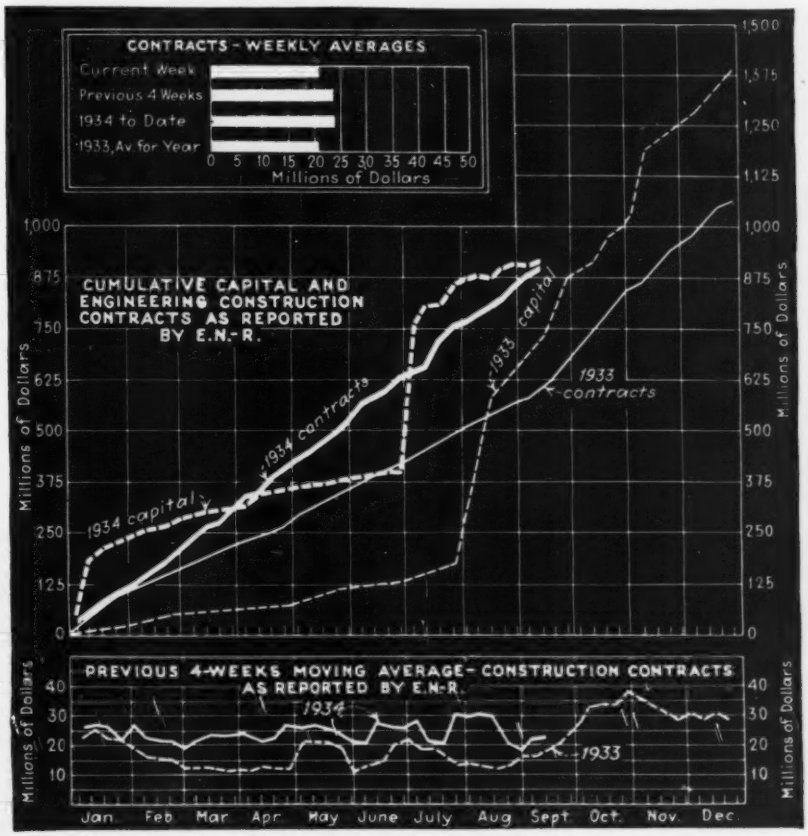
| 1934 | Week Sept. 13 | Cumulative |
|---|---|---|
| State and municipal | $10,056 | $239,027 |
| PWA allotments, S&M. | 4,343 | 601,610 |
| RFC loans, S&M | .... | 9,463 |
| Corporate issues | .... | 18,081 |
| PWA allotments, private | .... | 54,272 |
| Total, Non-Federal. | $14,399 | $922,453 |
| PWA allotments, Federal Constr. | 345 | 183,423 |
| Total new capital | $14,054 | $1,105,876 |

Cumulative to date:
1933.....$717,471 1934.....$922,453

**Note:** These figures include private bonds, and stocks sold for productive purposes; state and municipal bonds for construction; PWA loans and grants to states and municipalities, including the special highway funds; PWA private loans, and allotments for Federal construction.

### INDEX NUMBER

| E.N.-R.- Cost | 1913 = 100 | 1926 = 100 | E.N.-R.- Volume | 1913 = 100 | 1926 = 100 |
|---|---|---|---|---|---|
| Sept., 1934 | 200.58 | 96.41 | Aug., 1934 | 94 | 42 |
| Aug., 1934 | 198.40 | 95.37 | July, 1934 | 128 | 56 |
| Sept., 1933 | 175.48 | 84.35 | Aug., 1933 | 73 | 32 |
| 1933 (Av.) | 170.18 | 81.80 | 1933 (Av.) | 102 | 45 |
| 1932 (Av.) | 156.97 | 75.45 | 1932 (Av.) | 127 | 56 |
| 1931 (Av.) | 181.35 | 87.17 | 1931 (Av.) | 220 | 96.5 |



# Construction Equipment and Materials

## Hose-Type Form for Circular Openings in Concrete

A new form for making circular openings in concrete has been placed on the market by the Flexicore Co., Wichita, Kansas, under the trade name Flexicore. The new form is a flexible core which expands in diameter and decreases in length when subjected to internal pressure, either of air or of water. This action is reversed when pressure is released, the diameter decreasing and the length increasing.

The core is available in sizes from 1 to 24 in. in diameter and in lengths which permit telephone, telegraph and power line

**Flexicore, for forming circular openings in concrete. When the internal pressure is released, the form decreases in diameter and increases in length, facilitating removal.**

conduits, sewers, culverts, subgrade drains, irrigation systems, etc., to be built monolithic or without joints except where needed for other reasons.

The core is placed in the concrete in an inflated condition. After the concrete has set, the core is deflated and the combined decrease in diameter and increase in length insures its positive detachment from the concrete. Because of its flexibility, bends and turns can be made without the use of special shapes or forms.

## New Heating Kettle For Road Materials

A new heating kettle for road materials has been announced by the Good Roads Machinery Corp., Kennett Square, Pa. The kettle is spring mounted with roller bearing steel wheels and solid rubber tires, although pneumatic tires can be furnished when desired. A fuel tank is located at the forward end of the kettle. The burner is locked into place when heating the tank but is quickly removable and available for weed burning, surface warming, or other use when necessary.

**New heating kettle announced by Good Roads Machinery Corp.**

At present two sizes of these kettles are available, having capacities of 75 gal. and 110 gal., respectively.

## New Equipment in Brief

*Mixer.* The Koehring Co., Milwaukee, Wis., has developed the new 10-S Dandie Trail-Mix. The charging skip is free from obstruction at the front and side, permitting convenient and fast loading.

*Acetylene Generator.* The Linde Air Products Co., New York, N. Y., has announced a new generator known as the Oxweld type MP-4 portable acetylene generator. It is intended for portable service only, and is specially designed to withstand the abuse encountered in such service. It has a carbide capacity of 150 lb. It is rated to produce 300 cu.ft. of acetylene per hour. Fully charged it weighs 2,250 lb.

*Arc Welder.* A new arc welder, manufactured by the Universal Power Corp., Cleveland, Ohio, eliminates the need for reactors by obtaining its arc stabilizing effect through adjustments within the welding generator itself. The maker states that this feature reduces the time required for starting and the time consumed in maintaining an arc, and raises the overall efficiency of the unit. The unit is portable and weighs 1500 lb.

*Storage Battery.* The Electric Storage Battery Co., Philadelphia, Pa., announces that Exide-Ironclad batteries are now equipped with separators of Exide Mipor, a form of vulcanized rubber which is permeated with microscopic passages permitting the free diffusion of electrolyte. These separators are not affected chemically by the electrolyte solution and are immune to heat developed in a battery, the manufacturer states.

*Hypochlorite Feeder.* A device for feeding hypochlorite solutions directly into a water system has been introduced by Proportioneers, Inc., Providence, R. I. The device incorporates the Tret-O-Unit made by the same company. The rate of feed of the hypochlorite solution is automatically proportioned to the rate of flow through the line. It is controlled by any flow responsive device, such as a water meter, venturi meter or orifice. It can operate at any point where the waterline can be cut for installation.

## New Publications

ALCO ELECTRIC WELDED STEEL PIPE. Bulletin 1016. 8½x11. 20 pages. Alco Products Co., Inc., New York, N. Y.

SAVINGS EFFECTED BY BAILEY BOILER METER. Bulletin No. 44-A. 8x10½. 32 pages. Bailey Meter Co., Cleveland, Ohio.

HERCULES BODIES. 8½x11. 16 pages. Hercules Products, Inc., Evansville, Ind. Auto truck bodies.

ANACONDA WELDING RODS. 8½x11. 16 pages. The American Brass Co., Waterbury, Conn.

LINK-BELT GENERAL CATALOG 600. 1024 pages. Link-Belt Co., Chicago, Ill.

GOODALL RUBBER PRODUCTS. 8½x11. 80 pages. Goodall Rubber Co., Inc., Philadelphia, Pa.

AUSTIN NO. 11 HAND CONTROL GRADER. Bulletin 1326. 8½x11. 28 pages. Austin Western Road Machinery Co., Chicago, Ill.

FEDERAL SEABOARD WALL ASHLAR. 8½x11. 24 pages. Federal Seaboard Terra Cotta Corp., New York, N. Y.

TELSMITH WHEELING JAW CRUSHER. 8x10½. 20 pages. Smith Engineering Works, Wilwaukee, Wis.

HENDRICK FLANGED LIP SCREENS. 8½x11. 8 pages. Hendrick Mfg. Co., Carbondale, Pa.

NEW FROM START TO FINISH. Catalog No. 30. 8½x11. 160 pages. The Deming Co., Salem, Ohio. Pumps, water systems and auxiliary parts and equipment.

TRUCK AND TRAILER SIZE AND WEIGHT RESTRICTIONS. 4x7. 53 pages. Four Wheel Drive Auto Co., Clintonville, Wis.

STRENGTH OF CORRUGATED IRON PIPE. 8½x11. 6 pages. Armo Culvert Manufacturers Association, Middletown, Ohio.

CATERPILLAR ROAD MACHINERY CONDENSED CATALOG. 6x9. 30 pages. Caterpillar Tractor Co., Peoria, Ill.

## Business Notes

BARRETT CO., New York, N. Y., announces that Alfred L. Loebenberg has been made vice-president and assistant to the president.

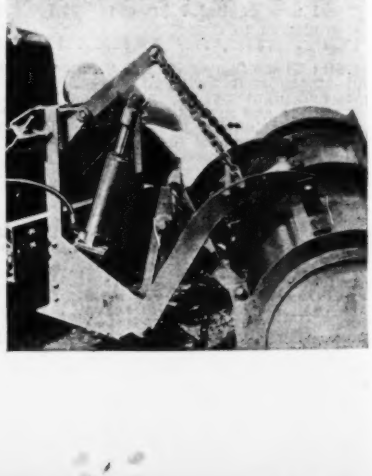
THE SWARTWOUT CO., Cleveland, Ohio, announces that B. K. Paget has been placed in charge of ventilator sales, with headquarters at Cleveland.

ROBINS CONVEYING BELT CO., New York City, has acquired the coal and ore handling business of the Mead-Morrison Manufacturing Co., Boston, Mass., and that company is to be operated henceforth as the Mead-Morrison Division of Robins Conveying Belt Co.

## Hydraulic Lift for Snow Plow Has Pump Within the Cab

The Blackhawk Manufacturing Co., Milwaukee, Wis., has announced a hydraulic "Lightning Blade-Lift" for snow plows. The new development is featured by a reservoir and twin pumps within the cab, connected by flexible hose with the ram that raises the plow. The handle of the pump is within easy reach of the driver's hand. To lower the blade, the operator opens the release valve on top of the control unit.

**"Lightning Blade-Lift" for snow plows.**



# CONSTRUCTION REPORTS

## WATERWORKS

### PROPOSED WORK

**Ark., Little Rock** — Arkansaw Water Co., plans installation of water softening plant. All necessary material and equipment have been ordered, all excavation for foundation of steel tanks and buildings will be let to local contractors and bids are now being received from local contractors. Est. $60,000. S. R. Brough, supt. Noted Aug. 16.

**Calif., Eureka**—City voted $959,000 bonds to secure $318,000 P.W.A. loan and grant for water system, incl. dam on Mad River tunnel, reservoir, pipe line. C. C. Kennedy, Call Bldg., San Francisco, engr. Noted Aug. 23.

**Calif., Upland**—City rejected bids Aug. 16, constructing 2½ m.g. rein.-con. reservoir, requiring 45 tons reinforcing steel, 27,000 sq.ft. Clinton mesh, 4,800 sacks cement (paper), 1,400 tons sand and gravel, miscellaneous lumber, 26,600 sq.ft. 85 lb. roofing, Pioneer or equal, one 18 in. x 8 ft. c.i. p. Class B, one 6 in. x 8 ft. c.i. p. Class B, one 18 in. and one 6 in. gate valve, flanged. P.W.A. authorized R. G. Manley, City Hall, purch. agt., to purchase in open market.

**Ill., Percy**—City rejected bids Aug. 6, complete waterworks and distribution system. $35,000. Will readvertise. P.W.A. project. G. E. Wells, Inc., 420 Security Bldg., St. Louis, Mo., engrs. Noted Aug. 9.

**Ind., Lebannon**—City Council plans installing water softening plant. J. C. Perkins, mayor. Noted July 14.

**Ind., Spiceland**—Town Bd. making plans water supply system. $45,000. P.W.A. loan granted. Lennox & Matthews, 537 Architects Bldg., Indianapolis, engrs.

**La., Logansport**—City making plans waterworks, incl. deep well, pumping station, reservoir, storage tank and distribution extensions. C. D. Evans, Shreveport, engr. P.W.A. awarded $43,000 for same. Noted Feb. 22.

**Mich., East Lansing**—H. W. Lott, city clk., cancelled P.W.A. contract for loan and grant for waterworks equipment, incl. deep well, turbine pump and water softening system. $50,000. New bids will be asked on a contract to be financed by the city. F. W. Dodge, city engr. Noted Aug. 23.

**Mich., Grand Rapids** — City making plans watermains for extension of system in 4th St. from Covell to Bristol Aves. in Covell Ave. from Bridge to 4th Sts.; large mains in Division Ave.-Garden St. Dist. and in Bristol Ave., west of 7th St. $38,000. G. C. Dillman, Grand Rapids, dir. Public Service.

**Mo., Louisiana**—City plans waterworks and distribution system and sanitary sewers, etc. $210,000 allotted for waterworks and $96,000 for sewers. May purchase present distribution system. W. A. Fuller, 2916 Shenandoah Ave., St. Louis, engrs. Noted Feb. 8.

**Mo., Springfield**—City rejected application for P.W.A. grant and loan of $3,600,000 for waterworks and distribution system. Russell & Axon, 4903 Delmar St., St. Louis, consult. engrs., and J. F. Hendrickson, city engr.

**Mont., Ekalaka**—City, postponed bids to have been opened Aug. 25, waterworks system. $50,000. R. N. Stewart, Miles City, engr.

**N. J., Florham Park**—Boro rejected bids Aug. 30, waterworks. P.W.A. project, Jaros, Baum & Bolles, 1350 Bway., New York, engrs. Noted Aug. 16.

**N. Y., Westfield**—Village retained Alexander Potter, engr., 50 Church St., New York, to make study of water system and prepare plans to enlarge facilities. To exceed $12,000. Noted Aug. 30.

**O., Ashland** — Ashland Co. voters approved proposed bond issue of $16,000 to finance new waterworks system.

**O., Madeira**—City plans waterworks plant. $49,000. P.W.A. project. J. S. Rafferty, Court House, Cincinnati, co. sanitary engr.

**O., Reynoldsburg**—City plans waterworks systems. P.W.A loan and grant $42,000 approved by Washington authorities. Jennings-Lawrence Co., 12 North 3rd St., Columbus, engrs. Noted July 27, 1933.

**O., Wooster** — City, making plans water softening at municipal waterworks. $52,000. J. E. Fox, city engr. Noted Aug. 30.

**Okla., Altus**—City made preliminary plans 12,800 ft. 4 and 6 in. c.i. watermain extensions in Walnut, Pecan and Blaine Sts. $20,000. J. C. Chisum, Altus, engr. Noted June 27, 1933.

**Okla., Blackwell**—Election Sept. 18, $101,000 dam across Chikeskia River and 5 mi. pipe line, incl. 27,000 ft. 12 in. c.i. pipe. C. A. Stoldt, Blackwell, engr. Noted Aug. 9.

**Tex., Athens**—City, c/o E. B. Gaunt, mayor, postponed indefinitely bond election for waterworks and sanitary sewerage systems, $89,370. Willard & Conrad, Esperson Bldg., Houston and Athens, engrs. Noted July 12.

**Tex., Jewett**—City, c/o T. C. Evans, mayor, plans waterworks improvements, $31,000. P.W.A. approved $29,000 allotment. D. M. Duppeller, 1618 2nd National Bank Bldg., Houston, engr.

**Tex., Littlefield** — City, c/o W. R. Street, mayor, voted $39,000 for waterworks improvements, incl. deep well, power house, power transmission lines, distributing lines. P.W.A. project. H. N. Roberts, Lubbock, engr. Noted Aug. 16.

**Tex., Morton**—City, H. Cox, mayor, soon takes bids waterworks system, 9,990 ft. 2- to 8-in. pipe; pumping plant, 100 g.p.m. at 150 ft. turbine well pump driven by 100 hp. engine. P.W.A. project. H. N. Roberts, 2415 20th St., Lubbock, engr. Noted Aug. 9.

**Tex., Olney**—City, c/o E. Hill, mayor, will re-submit application to P.W.A. to increase loan from $70,800 to $132,500 for waterworks improvements. P.W.A. project. Montgomery & Ward, Harvey-Snider Bldg., Wichita Falls, engrs. Noted Mar. 29.

**Tex., Rosebud**—City, c/o E. A. Donaldson, mayor, P.W.A. allotment of $20,000 for waterworks improvements, rescinded. Est. $21,000. V. B. Harris, Rosebud, engr. Noted July 12.

**Tex., Santa Anna**—City, c/o W. E. Baxter, mayor, voted $47,694, for waterworks improvements, incl. mains, fire plugs, pumping unit, probably steel tank and tower. Total est. $53,714. P.W.A. project. M. M. Moseley & Associates, Coleman, engrs. Noted Aug. 16.

**Tex., Thornton**—City, J. F. Stewart, soon takes bids complete water system with 50,000 gal. elevated tank and complete sewerage system. $59,000. P. W. A. project. Koch & Fowler, Central Bank Bldg., Dallas, engrs.

**Alta., Edmonton**—A. W. Hadden, city engr., preparing plans for watermain extension $41,500; also for paving 100th Ave. from 100th to 118 St., $66,800.

**Que., Laval des Rapides**—Town, located on Isle Jesu, which lies immediately to the north of the Island of Montreal, has asked Montreal Water Bd. of city of Montreal to supply it with water. Installation of new 36 in. water-main is envisaged which will serve a newly developing part of the city of Montreal, before crossing the Back River by way of the C.P.R. Bordeaux Bridge. Sufficient water would be supplied so that Laval des Rapides could pump supplies to adjoining rural municipalities on Isle Jesu. Est. cost about $149,000. The immediate necessity for the expenditure being that the Provincial Bd. of Health is objecting to the nature of the existing supply being taken from the Riviere des Prairies (or Back River).

### BIDS ASKED

**Colorado**—Sept. 25, by Bd. Water Comrs., Denver, enlarging and lining part of Moffat Water Tunnel, Intake Shaft and wye, involving 1,200 yd. excav., Gilpin and Grand Counties. There will railroad sidings for unloading supplies at both East Portal and West Portal Highways lead to both portals, West Portal being on Victory Hy. U. S. 40, there will be approximately 4,300 cu.yd. concrete lining, 135,000 lb. reinforcing steel, $105,000 lb. steel lining, etc. Approximately $200,000. D. D. Gross, City County Bldg., Denver, engr.

**Ill., Homewood**—Sept. 21, by Village, Village Hall, waterworks. $52,000. P.W.A. project. Consoer, Townsend, Older & Quinlan, 205 West Wacker Dr., Chicago, engrs.

**Ia., Martelle**—Sept. 21, by H. Graaff, city clk., waterworks system improvements. $12,000. P.W.A. project. R. W. Gerhardt, Cedar Rapids, engr. Noted Aug. 2.

**Ia., Oskaloosa** — Sept. 29, by Bd. Waterworks Trustees, improving local waterworks system, incl. raw water pumping station and equipment, chemical storage house, water softening tanks, reconstructing high pressure pumping station. Est. not to exceed $100,000. $27,000 P.W.A. grant will be received. Noted Aug. 2.

**Mich., Port Hope**—Sept. 21, by B. R. Welb, village clk., 1,400 ft. 10 in. intake pipe, $13,000. W. R. Ransom, Oliver Bldg., Saginaw, engr. Noted Sept. 6.

**Minn., Warroad**—Sept. 21, by Village, M. O. Akre, recdr., constructing pump house and furnishing, installing pump and minor equipment. A. F. Meyer, 628 Metropolitan Bank Bldg., Minneapolis, engr. Noted Aug. 2.

**O., Cleveland**—Sept. 20, by City, c.i. watermains for water distribution drainage and sprinkler system for mall site.

**Tenn., Jamestown**—Mayor drawings complete and takes bids about Sept. 30, complete waterworks system, drilling 2 deep wells, 2 deep well pumps, 100,000 gal. elevated tank, 100 ft. high, distribution system, c.i. mains, etc. $42,000. P. W. A. project J. A. Switzer, Engineering Bldg., Knoxville, engr. Noted Dec. 28.

**Tenn., Oliver Springs**—City bids about Sept. 15, complete waterworks system, 1 deep well, one 100 gal. p.m. deep well pump, 250,000 gal. concrete reservoir, 4, 6 and 8 in. c.i. pipe, $35,000. P. W. A. project. C. Wallace, 626 Market St., Knoxville, engr.

**Tex., Austin**—Oct. 3, by City, c/o J. G. Morgan, mgr., Contr. 1, constructing 4 m.g. settling basin, 3,000 cu.yd. concrete and 440,000 lb. reinforcing steel, $85,000; Contr. 2, waterworks improvements, incl. filter and headhouse addtions to water filtration plant, 2nd floor addition to rein.-con. brick building, 2 lime hoppers to headhouse, etc., $17,000; Contr. 3, altering boiler room and power plant, maintenance building, cement floors, add 2 room wire cage toolroom, new metal windows, mezzanine floor, new metal windows, steel doors with pilot sliding doors, $10,000. P.W.A. project. J. E. Motheral, city engr. Hawley-Freese & Nichols, Capps Bldg., Austin, consult. engrs.

**Tex., Leonard**—Sept. 24, by City, waterworks improvements, 640 ft., 4 and 8 in. c.i. pipe, 80 ft., 4 in. vitr. clay pipe, c.i. fittings, 4 in. c.i. gate valves, relocating pump equipment $4,500. P.W.A. project. B. C. May, Mayor. D. C. Walmsley, Thomas Bldg., Dallas, engr. Noted Mar. 1.

**Tex., Marble Falls**—City, C. M. Marrs, mayor, taking bids waterworks system, incl. 75 ft. steel tower, 150,000 gal. steel tank, pumps, water dosing equipment, 2- to 8-in. water lines, valves, fire hydrants. $43,000. P.W.A. project. H. R. F. Helland, Frost Bldg., San Antonio, engr. Noted Aug. 9.

### CONTRACTS AWARDED

**Ala., Guin**—City, waterworks and sewers, to Dunn Constr. Co., Lincoln Life Bldg., Birmingham, $79,000. **P.W.A.**

**Ala., Springville**—Town, pump, motor springs, elevated tank, distribution mains, meters, etc., to Christie, Hutchinson & Burton Constr. Co., 113 3rd Ave. N., Birmingham, $37,500, with town guaranteeing $1,500 overage. Bids Aug. 15. **P.W.A.** Noted Aug. 9.

**Ala., Sylacauga**—City, waterworks, to Smith-Pew Constr. Co., 435 Irwin St. N.E., Atlanta, Ga., and W. H. O'Toole Co., Atlanta, Ga., $129,000. **P.W.A.**

**†La., Franklin**—U. S. Eng., New Orleans, removing old and constructing new water line and timber and pile trestle at waterline crossing Harenton-Intracoastal Canal Levee, to J. A. Saunee, 1204 Desire St., New Orleans, $5,286. Bids Aug. 13, awarded Aug. 28.

**Md., Elkridge**—Comrs. Howard Co., Ellicott City, laying mains for proposed water system to Lignon & Lignon, Rockville, $67,990. **P.W.A.** Bids Aug. 28.

**Mich., Wyandotte**—City, furnishing piping and special connections for new pumping equipment installations, to Couse & Saunders, 415 Brainard St., Detroit, $10,426. Bids Aug. 13, awarded Aug. 28. Noted Aug. 9.

**Minn., Green Isle**—Village, erecting tank and tower for waterworks, to Challenge Co., Batavia, Ill., $3,500•••pump, to Crane Co., 386 Bway., St. Paul, $1,399•••pump house, to Arlington Cement Stone Wks., Arlington, $400. Grand total $5,299. **P.W.A.** Bids Aug. 27. Noted Aug. 23.

**Mo., St. Louis**—Bd. P. Serv., City Hall, laying watermains in Lawton and Bremen Aves., to W. F. Riley & Son, Inc., 110 North 7th St., $11,060 est. $12,520; repairing stone arch

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*Federal Government projects are classified under heading denoting type of work and designated by symbol of †*

◆

†*Federal Government.*

Waterworks (Continued)

bridge over Maline Creek, to Gunite Concrete & Constr. Co., Syndicate Trust Bldg., $1,602 est. $3,520. Bids Aug. 21, awarded Aug. 28. Noted Aug. 2.

**Mont., Big Timber**—City, waterworks improvements, incl. replacing wooden pipe in supply line with 27,100 lin. ft. Spiweld pipe supply line, 29,405 lin. ft. 4- to 14-in. c.i. distribution system, reservoir, to Three Bros., Lovell, $136,373. **P.W.A.** Bids Aug. 29.

**Nev., Fallon**—City, 24 in. well, 260 ft. deep, to Western Well Drilling Co. Ltd., 522 West Santa Clara St., San Jose, Calif., $6,028***9,900 ft. 10 in. steel supply main, to N. M. Ball, 1889 Yosemite Ave., Berkeley, Calif., $30,666***3,820 ft. 10 in. c.i. pipe, to U. S. Pipe & Fdry. Co., Monadnock Bldg., San Francisco, $5,730***32,077 lin.ft. 4- to 8-in. c.i. pipe, to Pacific States Cast Iron Pipe Co., Rialto Bldg., San Francisco, Calif., $24,654***1 m.g. concrete lined reservoir, to Dodge Constr. Co., Fallon, $23,880. Grand total $90,958. Est. $100,000. **P.W.A.** Will not take bids Sept. 8. Bids Aug. 8. Noted Aug. 2.

**O., Hamilton**—R. P. Price, City mgr., water softener plant and equipment, Sect. "A" electric work, to Beltzhoover Electric Co., 4th and Plum Sts., Cincinnati, $52,920***Sect. "B," outside piping and roadway work, to Walter S. Rae Co., Oliver Bldg., Pittsburgh, Pa., $66,418***Sect. "C," filters and equipment, to Roberts Filter Mfg. Co., Darby, Pa., $82,990***Sect. "D," buildings, to F. K. Vaughn Building Co., $222,576. Grand total $424,904. **P.W.A.**

**O., Lucas**—Village Council, waterworks system, to Simon Small & Sons, Walpark Bldg., Mansfield, $26,846. **P.W.A.** Bids July 17. Noted June 28.

**O., New Philadelphia**—City, T. Edwards, dir. Service, 2 m.g.e.p.d. water softening plant, three 12x16x10 ft. filters, 100,000 gal. soft water storage, to Wendling Bros. Co., Walnut and Slinguff Sts., Dover, $71,055. **P.W.A.** Bids July 9. Noted July 5.

**O., Worthington**—Village, Bd. P. Affairs, R. C. Eicher, clk., zeolite softening plant, to Dunning & Hetrick, 12 North 3rd St., Columbus, $19,057. **P.W.A.** Noted Nov. 9.

**S. C., Spartanburg**—City, erecting 1¼ m.g. elevated tank, to R. D. Cole Co., Newman, Ga., $57,884. **P.W.A.** Lockwood Greene & Co., Montgomery Bldg., consult. engrs. Noted Feb. 8.

**S. D., Rapid City**—City, drilling well about 1,200 ft. in Tourist Park, to Norbeck Co., Redfield, $9,700. **P.W.A.**

**Tex., Arp**—City, elevated tank for waterworks system, to Pittsburgh-Des Moines Steel Co., Practorian Bldg., Dallas, $5,950**well and pump, to W. A. Meller, Arp, $4,640***waterworks system, to Winslett & Davis, Dallas, $16,440. Grand total $27,030. **P.W.A.** Bids Aug. 20. Noted Aug. 9.

**Tex., Brownsville**—See "Earthwork, Irrigation, Drainage and Waterways."

**Utah, Moab**—City installing gravity water system, to V. R. Bush, Moab, $28,722. Est. $30,000. **P.W.A.** Bids Aug. 31. G. F. McGonagle, 450 South 13th East St., Salt Lake City, engr. Noted June 21.

**Vt., Barton**—Village, c/o Village Clerk, constructing 500,000 gal. per day capacity filtration plant and equipment, to Norwood Eng. Co., Florence, approximately $15,000. Noted Aug. 30.

**W. Va., Shinnston**—Town, constructing dam for creating reserve water supply, laying 8,500 lin.ft. pipe line, to O. J. Yoho, Cameron, $35,768.

**Ont., Alymer**—Public Utilities Comn. constructing 50,000 (Imperial) gal. steel tank, to Horton Steel Co. Ltd., 40 Jennett St., Fort Erie, and Northern Ontario Bldg., Toronto, $4,900. Awarded Sept. 1. Noted Aug. 2.

## SEWERAGE AND WASTE DISPOSAL

### PROPOSED WORK

**Ariz., Phoenix**—City soon takes bids 64,803 lin.ft. 8- to 60-in. concrete storm sewer pipe, $270,000. J. Gerand, city engr. Noted Aug. 2.

**Calif., Burlingame**—Voted $86,000 bonds to secure P.W.A. loan and grant of $147,000 to construct sewage disposal plant and sewers. C. M. Thomas, city engr. Noted July 19.

**Calif., Fresno** — City making plans storm sewer in Wishon Ave. between University Ave. and Dry Creek and storm sewer in area bounded by L. Stanislaus, Divisadero and Clark Sts. $30,000 or more. J. L. Vincenz, City Hall, engr. Noted Jan. 11.

**Calif., Petaluma**—City Council defeated $325,000 bonds sewerage system. Noted Aug. 2.

**Calif., Richmond**—E. A. Hoffman, city engr., making surveys on sewer replacement and extension program. City Council will probably seek Federal aid in financing.

**Calif., San Mateo**—Defeated $85,000, for outfall sewer and treatment plant. City Council proposed to secure $141,000 loan and grant from P.W.A. for project. Noted Aug. 16.

**Conn., Milford**—Town, federal grant of $201,000 rescinded when town votes down plans for bond issue to finance loan of balance for sewerage system. Est. $1,000,000. Metcalf & Eddy, 1300 Statler Bldg., Boston, Mass., engrs. Noted Jan. 4.

**Ill., Collinsville**—Bd. Local Imprvts., City Hall, rejected bids Aug. 24, sewage disposal plant, auxiliary piping, pumping station, 8- to 24-in. sewers in Sewer Dist. B, $139,398. Project abandoned. Noted Aug. 16.

**Ind., Evansville**—City making plans sewer projects, $1,171,000. P.W.A. loan granted. Greeley & Hansen, 6 North Michigan Ave., Chicago, Ill., engrs. Noted July 12.

**Mich., Detroit** — Wayne Co. making plans straightening, deepening, relocating, drains in Wayne Co. open drains emptying into Huron and Rouge Rivers and Ecorse Creek, $750,000. L. J. Nowicki, Barium Bldg., county drain comr.

**Mich., Dexter**—Village preparing plans sewerage system and sewage disposal plant, $51,320. Ayres, Lewis, Norris & Max, Ann Arbor, engrs.

**Mo., Louisiana**—See "Waterworks."

**Mo., St. Clair**—City soon takes bids sewage disposal plant and sanitary sewers, $45,000 grant and loan allotted by P.W.A. W. A. Fuller Co., 2916 Shenandoah Ave., St. Louis, engrs.

**O., Canton**—City plans constructing storm water sewers in Forest Ave. S.W., Exter Ave., Fawcett Court, Glen Pl., 7th, and Tuscarawas Sts. $48,819. J. Shisler, City Hall, engr.

**O., Columbus**—W. J. Lucks, dir. Serv., plans completed constructing 2,300 ft. 84 in. concrete or rein.-con. outlet conduit extending from sewage disposal plant to Scioto River, Contr. 1, $90,000. P.W.A. project. P. W. Maetzel, City Hall, engr.

**Tex., Athens**—See "Waterworks."

**Tex., Mount Calm**—City, plans sewerage system, $25,000. P.W.A. approved $19,000 allotment. J. Rady, 400 Majestic Bldg., Fort Worth, engr.

**Tex., Thornton**—See "Waterworks."

**Wash., Seattle**—City soon takes bids constructing Ballard Trunk Sewer in Ballard Dist., $321,253. $67,000 allotted by P.W.A. T. R. Beeman, County City Bldg., engr.

**Man., Winnipeg**—City retained W. S. Lee, engr., 1221 University St., Montreal, Que., to prepare plans for sewage disposal plant, $3,000,000. Noted Oct. 12.

### BIDS ASKED

**Conn., Bridgeport**—City, J. McLevy, mayor, bids about Sept. 20, garbage and rubbish incinerator, $150,000. F. Toquet, City Hall, engr.

**Conn., Hartford**—Oct. 2, by Bd. Contr. & Supply, constructing 7,937 ft. 6 ft. 3 in. sewer, consisting of 120 ft. of open cut, 6,430 ft. rock tunnel and 1,387 ft. earth tunnel. R. Dillon, clk.; adv. E.N.-R. Sept. 13.

**Ill., Chicago**—Sept. 20 by H. E. Wallace, acting clk. Sanitary Dist. of Chicago, 910 South Michigan Ave., constructing 840 lin.ft. concrete sewer of two 9 ft. barrel section in tunnel, 2,280 lin.ft. concrete sewer 9 ft. internal width in tunnel, an overflow chamber, excavating, lining, bracing, disposal of water, furnishing, placing concrete, reinforcement steel, iron castings, backfilling, disposal of excess material, etc., Div. H; furnishing, delivering 18,000 ft. 12 in. square diffuser plates for use in diffusing air in aeration tanks and aerated channels of Calumet Sewage Treatment works extension Div. I, both for Calumet Sewage Treatment Works extension, located south of East 26th St., extended east of Chicago & Western Indiana R.R., west of Michigan Central R.R. and Cottage Grove Ave. and north of East 130th St.

**Md., Cumberland**—Sept. 25, at office City Clerk, Contrs. 1 and 2, intercepting sewerage system, G. W. Legge, mayor. Gannett, Eastman & Fleming, Inc., 600 North 2nd St., Harrisburg, Pa., consult. engrs. Noted Sept. 6.

**Minn., Lakeville**—Sept. 24, by Village, J. J. Metzall, clk., sanitary sewerage system and treatment plant, $25,000. Druar & Milinowski, 830 Globe Bldg., St. Paul, engrs.

**Mo., Springfield**—Sept. 18, by City, extending drainage system in Jordan Valley, Bond Issue Sewer Item 20, $90,000. J. F. Hendrickson, city engr. Russell & Axon, 4903 Delmar Blvd., St. Louis, consult. engrs. Noted Aug. 2.

**New York** — Sept. 25, by Dpt. Sanitation, Municipal Bldg., New York, altering and constructing additions to Bergen Landing and Betts Ave. Destructor Plants, Queens Boro.

**N. Y., Beacon**—Sept. 25, by Dpt. Correction, State Office Bldg., Albany, constructing sewers and waterlines at hospital. P.W.A. project.

**N. Y., Brentwood**—Sept. 26, by Dpt. Mental Hygiene, State Office Bldg., Albany, sewers and waterlines at Pilgrim State Hospital.

**N. Y., Brooklyn**—Sept. 19, by R. V. Ingersoll, pres. Brooklyn Boro, Boro Hall, constructing combined sewers in Avenue L, Ralph Ave., East 54th, East 55th and East 56th Sts.; storm water sewer from intersection of Flatlands Ave. and Ralph Ave. southeasterly across Marginal St. wharf or place and other city-owned property at head of Paerdegat Basin.

**N. Y., Lloyd**—Sept. 17, by Town, Town Hall, sewers and plant, $142,900. P.W.A. project.

**N. Y., Long Island City**—Sept. 17, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., sewers in Lakeview Blvd., 115th Rd., Remsen, Digby and Borkel Pls., 40th, Greene, 92nd, 118th, 123rd, 127th, 133rd and 135th Aves.; 69th, Palmetto, 224th, Moline, 221st, 158th, 192nd, 153rd, 191st, 193rd, 200th, Denis, and Vanderveer Sts.

**N. Y., Newark**—Sept. 26, by Dpt. Mental Hygiene, State Office Bldg., Albany, sewers and waterlines at Newark State School. P.W.A. project.

**O., Cleveland**—See "Waterworks."

**Okla., Oklahoma City** — See "Contracts Awarded."

**Va., Clarendon**—Sept. 28, by Arlington Co. Bd., 41,200 ft. 8 and 12 in. sanitary sewers, Contr. 9; 33,460 ft. 33- to 42-in. sanitary sewer, Contr. 10; 440 ft. 33 in. open cut, 3,700 ft. 33 in. in tunnel, with 500 ft. of shaft, Contr. 11; 92,150 lin.ft. 8-to 18-in. sanitary sewers, Contr. 12. P.W.A. Owner furnishes pipe and manhole castings. J. N. Chester Engineers, 200 Lee Hy., Clarendon, engrs.

**Wis., Milwaukee** — Sept. 20, by Sewerage Comn., furnishing, erecting structural steel, railings, grating for sewage treatment plant, $50,000; furnishing, erecting 36 in. pipe and valves and structural steel supports, $4,000. P.W.A. project. D. W. Townsend, Milwaukee, acting ch. engr.

**Wis., Sun Prairie**—Sept. 21, by H. R. Twiton, village clk., sewage treatment plant, incl. sludge collector for primary tank, and 1 for secondary tank; revolving distributor; one 220 g.p.m. and 300 g.p.m. sludge pumps; sludge pump plunger type; air blower for aeration tanks; hauling and installing all equipment furnished by others and furnishing materials and labor for sewage disposal plant. E. B. Parsons, Watertown, engr. Noted July 19.

### CONTRACTS AWARDED

**Calif., Los Angeles**—Bd. P. Wks., sanitary force main sewer in Harris Pl. and Terminal Way, involving 7,269 ft. 20 in. centrifugal rein.-con. pipe, (straight), 178 ft. centrifugal rein.-con. bends, alternate on c.i. pipe, to Artukovitch Bros., 4928 West Blvd., $28,027. Est. exceeds $40,000. Bids June 20, awarded Aug. 31.

**Conn., New Canaan**—Borough of New Canaan, constructing sanitary sewerage system, incl. pipe mains and pumping facilities, to J. P. Burns, Dumont, N. J., $57,081. Est. $88,000. **P.W.A.** Bids Aug. 16. Noted Aug. 9.

**Md., Ferndale**—Anne Arundel Co. Sanitary Comn., J. H. Ellis, chn., Glenburnie, 23,000 lin.ft. 8- to 12-in. terra cotta pipe, 6 in. house connections, manholes, sedimentation tank in various streets, to Chas. J. Spielman Co., 2210 Russell St., Baltimore, $36,082. **P.W.A.** Bids Aug. 13. Noted Aug. 2.

**Mass., North Adams**—City, Commissioner P. Wks., City Hall, constructing activated sludge sewage treatment plant, to Suburban Eng. Co., 15 West 38th St., New York, $145,817. **P.W.A.** Bids Aug. 2. Noted July 20.

**Mich., Battle Creek**—City, constructing 11,000 ft. 54 in. rein.-con. sewer, 1 inverted syphon and 1 river crossing, to Blanck & Gargaro, 40 Seven Mile Rd., Detroit, $154,251. **P.W.A.** Bids Aug. 30. Noted Aug. 2.

**Mich., Paw Paw**—City Clerk, constructing sewage disposal plant and lift station, to Geo. Hardin Constr. Co., 3139 Indiana Ave., Chicago, Ill., $16,996; concrete and vitr. sewer line, to J. Yerrington, Benton Harbor, $9,046. **P.W.A.** Bids Aug. 25. Noted July 12.

**N. H., Keene**—City, P. F. Babbidge, supt. Water & Sewer Dpt., City Hall, Contr. 1, concrete intercepting sewer, connecting sewers, force main and effluent main, to J. H. Ferguson & Co., 289 Chapman St., Providence, R. I., $102,800***Contr. 2, pumping station, Imhoff tanks and sludge beds, to Central Eng. & Constr. Co., 210 Main St., Pawtucket, R. I., $62,900***Contr. 3, pumping equipment, to Starkweather Eng. Co., 79 Milk St., Boston, Mass., $5,300. Grand total $171,000. **P.W.A.** Bids July 26. Noted July 19.

**Okla., Oklahoma City**—City, 11,000 ft. 8 and 10 in. sanitary lateral sewer in Miller Blvd. addition, Loth, Linn and Park Sts., hand labor, $30,000. L. M. Bush, city engr.

**Pa., New Castle**—City, City Bldg., storm sewers in 3 streets, improving West Side ravine, Ralph Ave., grading, fences in Robinson and West North Sts., retaining wall in Neshannock St., improving Narrows, washed out in recent flood, replacing sidewalks in Moravia St., day labor under supervision G. H. Hoskins, city engr. $30,000.

**Wis., Fox Point**—Metropolitan Sewerage Comn., constructing Fox Point Sewage Pumping Station, to Hunzinger Constr. Co., 1827 North 30th St., Milwaukee, $24,985. Bids Aug. 30. Noted Aug. 23.

## BRIDGES AND GRADE CROSSINGS

### PROPOSED WORK

**Mo., St. Louis**—Bd. P. Serv., City Hall, bids late in October or early in November constructing rein.-con. viaduct to carry Hampton Ave. across River Des Peres and Missouri Pacific and St. Louis-San Francisco Railroads, $410,000. $105,000 grant allotted by P.W.A. $305,000 will be financed through bond issue passed in February, 1923. B. F. Dickmann, mayor, signed ordinance for construction of same. Noted July 19.

**New Hampshire**—State Hy. Dpt., Concord, making plans 3 span, steel plate girder, rein.-

†*Federal Government.*

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Bridges, etc. (Continued)

con. deck bridge and abutments. P.W.A. loan and grant of $82,600 approved. F. E. Everett, comr. Hy. Dpt.

**N. Y., Duanesburg**—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, plans eliminating Esperance Station Crossing, Schenectady Co. $79,080. The owner was authorized to do certain work in connection with elimination at actual cost, the amount to be spent without contract being $18,080. Pub. Serv. Co. approved specifications and estimate of cost. Noted Oct. 13, 1932.

**N. Y., Olean**—Erie R.R. Co., G. S. Fanning, ch. engr., Midland Bldg., Cleveland, O., plans steel, concrete, overhead bridge to carry Olean-Hinsdale Hy. over tracks in town of Olean near here. $150,000.

**N. Y., Utica**—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, plans eliminating Schuyler Street Crossing, 1 mi. west of Utica Station. $292,700. The owner was authorized to do certain work at actual cost of $14,665 in connection with elimination of crossing. Pub. Serv. Comn. approved specification and estimate of cost.

**N. Y., Windsor**—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, plans eliminating Bridge Street Crossing on Windsor-Deposit State Hy., Broome Co. Pub. Serv. Comn. approved specifications and estimate of cost for $250,000 in connection with elimination of crossing. The owner was authorized to do certain work at actual cost without contract, the amount being limited to $87,436, to be done by direct employment of labor and purchase of materials. Noted Sept. 21, 1933.

**Alta., Edmonton**—A. W. Hadden, city engr., preparing plans for bridge at Latta Ravine. $60,000.

### BIDS ASKED

**Ga., Millens**—Oct. 2, by Jenkins Co., 1,337 ft. timber pile trestle bridge, 17½ ft. roadway, 6,844 lin. ft. piling and 208 M.B.F. timber. P.W.A. project. E. G. Smith, 311-314 Herald Bldg., Augusta, engr.

**Indiana**—Sept. 18, by J. D. Adams, chn. State Hy. Comn., Indianapolis, floor and repairs to bridge over Grand Calumet River, on Calumet Ave., Hammond Lake Co.; rein.-con. arch bridge over St. Mary's River, on Washington Ave., Fort Wayne, Allen Co.; steel girder subway under Wabash Railway, 3rd St., Logansport, Cass Co.; repairing bridge over Wabash River on Wabash St., Wabash Co.; rein.-con girder bridge over Curtis Ditch, 9.7 mi. east State Rd. 52, Benton Co.; steel beam on creosoting piling bridge over Pinch Creek, 2 mi. south of St. Mainrad, Spencer Co.

**Illinois**—See "Streets and Roads."

**Kentucky**—See "Streets and Roads."

**Minnesota**—Sept. 21, by State Hy. Dpt., St. Paul, replacing railroad underpass structure with bridge known as Bridge 5336, State Project 65-1-40, NRH 297-A, near Medford, Rice Co.

**New Jersey**—Sept. 24, by State Hy. Comn., Trenton, demolition Hackensack River Bridge on Bergen Turnpike in Little Ferry, Bergen Co. Bids Aug. 27 rejected. A. L. Grover, ch. clk. Noted Aug. 16.

**N. Y., East View**—Sept. 20, by New York Central R.R. Co., J. W. Pfau, ch. engr., 466 Lexington Ave., New York, constructing superstructure (incl. concrete work, drainage and waterproofing thereon) of bridge to carry tracks of Putnam Div. of railroad over Saw Mill River Parkway, at East View Station.

**New York**—See "Streets and Roads."

**N. Y., Elmira**—See "Contracts Awarded."

**Washington**—See "Streets and Roads."

**West Virginia**—See "Streets and Roads."

**Wyoming**—See "Streets and Roads."

**Wisconsin**—Sept. 25, by State Hy. Comn., Madison, constructing Tilden Mill Bridge on County Trunk Q, N.R.S. 546-A; Central Street Bridge County Hy. I, N.R.S. 547-A, both Chippewa Co.; Lambs Creek Bridge, N.R.S. 549-A; superstructure Dunnville Bridge, Co. Hy. Y, N.R.S. 551-A; superstructure Eau Galle Bridge, County Trunk Hy. D, N.R.S. 552-A; superstructure Elk Creek Bridge, County Trunk Hy. E, N.R.S. 553-A; Cedar Falls Bridge, County Trunk Hy. BB, Project 550-A, all foregoing Dunn Co.; Eau Claire River Bridge, N.R.S. 554-A, Eau Claire Co.

### CONTRACTS AWARDED

**Calif., Los Angeles**—Los Angeles Co., 7 span, 280 ft. concrete deck, steel girder bridge over Los Angeles River, Barnham Blvd., to Robbins & Immel, P. O. Box 902, Ventura, $51,950. Est. $58,000. Bids Aug. 20. Noted Aug. 9.

**Colorado**—State Hy. Dpt., Denver, 4 bridges and miscellaneous drainage structures on road between Branson and Tobe, State Hy. 100, N.R.S. 377, Constr. Div. 2, Las Animas Co., to Driscoll Constr. Co., Pueblo, $45,301. P.W.A. Bids Aug. 21, awarded Aug. 27.

**Georgia**—State Hy. Bd. Atlanta, constructing 1 bridge over Little Tired Creek, N.R.S. 508-B, Cairo-Pelham Rd. to Beckham-Lawler Constr. Co., Ferry, $8,700***bridge and approaches over Southern Ry., N.R.H. 44 A and B, Atlanta-Gainesville Rd., Hall Co., to A. Lyons, Rogersville, Tenn., $26,131. P.W.A. No bids taken for 1 bridge State Aid Project 523, Covington-Porterdale Rd., Newton Co., State may do work themselves. Noted Aug. 16, under "Streets and Roads."

**Indiana** — State Hy. Comn., Indianapolis, bridges in Lake Co., to S. S. Palma, Lafayette, $18,185 est. $24,552***bridge in Dearborn Co., to R. L. Schutt, 351 North Ritter St., Indianapolis, $14,176 est. $15,122. Bids Aug. 28. Noted Aug. 23.

**Ind., Porter**—New York Central R.R. Co., W. J. Pfau, ch. engr., 466 Lexington Ave., New York, subway on Road 20, near here, in connection with Indiana State Hys. Comn., to Ellington-Miller Co., 25 East Jackson Blvd., Chicago, Ill., $52,924. Bids July 17.

**Ind., South Bend**—New York Central R.R. Co., at office State Hy. Comn., Indianapolis, subway at Western Ave. and Walnut St., to Lowensohn Constr. Co., 1740 East 12th St., Cleveland, O., $145,173. Bids July 17. Noted July 12.

**In., Newton**—See "Streets and Roads."

**Mass., Waltham**—City, P. Wks. Dpt., City Hall, replacing bridge with 1 span, rein.-con. structural steel bridge over Charles River, at Farwell St., to J. B. Delaney & Son, 51 Irving St., and P. J. O'Malley Jr., 82 Massasoit St., $38,950. P.W.A. Bids Aug. 17. Noted Aug. 9.

**Missouri** — State Hy. Dpt., Jefferson City, bridges over Plum Creek, Rock Creek, and Mud Creek, Jefferson Co., to Davis Constr. Co., Inc., Boonville. Bids Aug. 10.

**N. Y., Duanesburg**—See "Proposed Work."

**N. Y., Elmira**—Erie R.R. Co., G. S. Fanning, ch. engr., Midland Bldg., Cleveland, eliminating grade crossings by constructing temporary trestles, etc., at Pennsylvania Ave., east of Chemung River, Water St. (high and low level) and west of 2nd St., incl. furnishing temporary and permanent track materials, permanent changes in signals, telephone, telegraph and interlocking equipment, day labor, $568,000. Public Service Comn. authorized work.

**N. Y., Elmira**—Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad Street Sta., Phila., Pa., 3 undergrade bridges and track elevation for eliminating grade crossings, to Sinclair & Grigg, 1518 Walnut St., Phila., Pa. Est. $300,000. Noted Aug. 9.

**N. Y., Liberty**—New York, Ontario & Western R.R. Co., W. C. Heidenthal, ch. engr., Middletown, eliminating crossings near here, to H. H. Smith, Inc., Middletown, $71,769. Noted Aug. 23.

**N. Y., Rochester**—City, Div. Purchase, constructing Elmwood Avenue Bridge, to G. A. Fuller Co., 597 Madison Ave., New York, $388,000. P.W.A. Bids Aug. 2.

**N. Y., Utica**—See "Proposed Work."

**Ohio**—O. W. Merrell, dir. hys., Columbus, constructing two bridges both with 50 foot span, timber, with steel beams, over Salt Creek and traffic, macadam paving 0.615 mi. approaches, Sect. "H" (parts) Athens-Laurelville Rd., Hocking Co., to Miller & Orndoff, Waterford, $42,965. Bids Aug. 31.

**Tex., Port Isabel**—Padre Island Co., 12,000 ft. causeway, 21 ft. wide, across Laguna Madre, to Dodds & Wedegartner, San Benito, approximately $288,000 (tentatively). P.W.A. Noted Aug. 9.

**Utah**—State Rd. Comn., Salt Lake City, 101 ft. span through plate girder underpass and approaches where Bamberger Electric crosses highway, in Davis Co., to T. G. Rowland, 1558 Yale Ave., Salt Lake City, $91,299. P.W.A. Bids Aug. 27, awarded Aug. 27.

**†Wyoming**—Pub. Rds., Custom House, Denver, Colo., 3 bridges in Yellowstone Park, to McLaughlin Constr. Co., Livingston, Mont., $50,817. Bids Aug. 15, awarded Aug. 31. Noted Aug. 2.

**†P. R., San Juan**—U. S. Eng., constructing Caguas River Bridge and approaches near Caguas, Puerto Rico, to Francisco Rexach y Sobrinos, Juncos, $19,957. Bids Aug. 15.

## STREETS AND ROADS

### BIDS ASKED

**Arizona** — Sept. 25, by State Hy. Comn., Phoenix, grading, draining 4 mi. Globe-Showlow Hy., N.R.H. 99-G, 326,600 cu.yd. roadway, 1,700 cu.yd. structural and 3,400 cu.yd. drainage excav.; placing cut-back plant mix with seal coat or 2½ in. Laykold, constructing shoulders, etc., on 6.5 mi. Hilbrook-Lupton Hy., N.R.H. 83-C and G. T. S. O'Connell, state hy. engr.

**†California**—Sept. 25, by Pub. Rds., C. H. Sweetser, dist. engr., 461 Market St., San Francisco, grading, constructing bridge on 0.571 mi. Sect. B, Route 51, Hoopa Natl. Forest Hy., Trinity Natl. Forest, Humboldt Co.

**California**—Sept. 27, by State Hy. Comn., State Bldg., Los Angeles, grading asphaltic concrete paving road between west city limits and Beverly Blvd., Los Angeles Co.; grading, fuel oil and bituminous surfacing 6.6 mi. road between point 5.5 mi. east of Llano and Camp Cajon, Los Angeles and San Bernardino Counties. C. H. Purcell, Pub. Wks. Bldg., Sacramento, hy. engr.

**Calif., Alhambra**—See "Contracts Awarded."

**Georgia**—Sept. 20, by State Hy. Dpt., Atlanta, grading, 1 bridge, culvert, 5.304 mi. Marietta-Atlanta Rd., N.R.H. 535-A, Projects 1 and 2, Cobb Co., involving 138,691 cu.yd. earth excav., etc.; 4.901 mi. Lincolnton-Augusta Rd., N.R.S. 506-B, Columbia Co., 56,789 cu.yd. earth excav.; grading 2.267 mi. Douglasville-Fairburn Rd., N.R.S. 525, Douglas Co., 28,403 cu.yd. earth excav.; 2.62 mi. Buford-Atlanta Rd., N.R.S. 496-E, Gwinnett Co., 62,405 cu.yd. earth and 150 cu.yd. structural excav.; 3.596 mi. Zebulon-Greenville Rd., N.R.S. 517-A, Pike Co., 50,059 cu.yd. earth excav.; 3.404 mi. Buford-Atlanta Rd., N.R.S. 534-A, DeKalb and Fulton Cos., 140,176 cu.yd. earth excav.; paving, bridging 0.028 mi. and 0.029 mi. Atlanta-Newman Rd., N.R.M. 490-B, Fulton Co., 800 cu.yd. excav.; 0.366 mi. and 0.149 mi. Canton Approach Rd., N.R.S. 533, Cherokee Co., 35,167 cu.yd. earth excav.; 1.492 mi. Hiawassee, Ga.-Hayesville, N. C. Rd., Towns Co., N.R.S. 530, 23,396 cu.yd. earth excav.; surface treating 1.679 mi. connection between Route 4 and Wrightsboro Rd., N.R.S. 527, Richmond Co., 13,039 cu.yd. earth excav.; 0.884 mi. Colquitt-Blakely Rd., N.R.M. and Ext. N.R.M. 159-A, Miller Co., 8,169 cu.yd. earth excav.; paving 2.86 mi. Jonesboro-Fayetteville Rd., N.R.H. and M. 280, Clayton Co., 38,200 cu.yd. earth excav.; 4.545 mi. St. Mary's-Kingsland Rd., N.R.S. 234-B, Camden Co., 17,057 cu.yd. earth excav.; 0.962 mi. Georgetown-Cuthbert Rd., N.R.M. 495-B, Randolph Co., 3,971 cu.yd. earth excav.; bridge on Atlanta-McDonough Rd., N.R.H. 258-C, Contr. 2, Fulton and De Kalb Counties; 1 overhead bridge over C. of G. R.R. on Crawford St., Extension in Americus, N.R.M. 348-B, Sumter Co.

**Idaho**—Sept. 28, by G. E. McKelvey, comr. P. Wks., Boise, grading, draining, crushed rock surfacing 3.538 mi. N.R.S. 182 Winchester Reubens Rd., Lewis Co., incl. 19,000 unclassified and 270 cu.yd. structure excav.

**Illinois**—Sept. 20, by Dpt. P. Wks. & Bldgs., Div. Hys., Springfield, concrete paving 0.99 mi. approaches to I.C. R.R. overhead, near Vergennes, Route 13, Sect. 15V; 1.21 mi. Route 16, Sect. 16X, Rosamond Northeast; 0.31 mi. Route 42, Sect. D, Waukegan-Sheridan Rd., Belvedere to Genesee Sts.; 0.14 mi. Route 47, Sect. 106X-1, gap at Lilly Lake; 0.05 mi. Route 53, Sect. 539X-1, gap at Calumet City; 4.67 mi. Route 104, Sect. 128X, Fishgah to Franklin; 8.49 mi. Route 140, Sect. 114, south of Lawler to Hardin Co. line; 9.84 mi. Route 140, Sect. 115, Cave in Rock to Gallatin Co. line; 2.02 mi. Route 173, Sect. 135X-, gaps at Natioch; 0.78 mi. approaches to Vermilion Rd. Bridge, Route 178, Sect. 108, at Lowell; 11.55 mi. Route 181, Sect. 109, Crawford Co. line to north of Route 12; sheet asphalt binder and superface courses on concrete paving 0.3 mi. Route 49, Sect. 49-2, Clark St. and Ashland Ave., Chicago; constructing rein.-con. pedestrian subway, at School Building, Glenview, Route 42-A, Sect. 3271 SB, E. Lieberman, ch. hy. engr.

**Indiana**—Sept. 18, by State Hy. Comn., Indianapolis, structure construction and extensions 8.1 mi. S-700, road from Columbia City to point ¼ mi. east of Whitley-Allen Co. line, Whitley and Allen Counties; 2.63 mi. from point 0.57 mi. north of Richmond and extending north 2.63 mi. and 3.28 mi. from southeast corner Sect. 4, on S.R. 27, to Winchester, S.R. 27, Wayne and Randolph Counties; bituminous concrete or rock asphalt on concrete paving 0.636 mi. Canal St. and Fares Ave. from Kentucky Ave. to Columbia St., Evansville, Vanderburgh Co.; rein.-con., bituminous concrete or rock asphalt on macadam paving 3.737 mi. Bedford to point 1¼ mi. north of Oolitic and 0.35 mi. Oolitic Northwest, S.R. 54, Lawrence Co.; rein.-con. paving 1.034 mi. Jeffersonville to Northeast S.R. 62, Clark Co.; bituminous mulch paving 1.081 mi. Feeder-Zionsville to S.R. 29 Rd., Boone Co.; 7.921 mi. Harrison-Floyd Co. line to S.R. 62, just west of New Albany, Floyd Co.; 4.13 mi. road in Kirklin to point 4 mi. southeast, Clinton and Boone Counties. J. D. Adams, chn.

**Kansas**—Sept. 18, by State Hy. Comn., at office of County Clerk, Oakley, sand graveling 76.109 mi. hys. in Trego, Phillips, Thomas, Rawlins, Rooks, Logan and Graham Counties. W. V. Buck, Topeka, engr.

**Kansas**—Sept. 19, by State Hy. Comn., at office of County Clerk, Jetmore, sand graveling 70.125 mi. hys. in Ness, Hodgeman, Gray, Clark and Meade Counties. W. V. Buck, Topeka, engr.

**Kansas**—Sept. 20, by State Hy. Comn., at office of County Clerk, Pratt, sand graveling 16.041 mi. hys. in Pratt and Cowley Counties. W. V. Buck, Topeka, engr.

**Kansas**—Sept. 21, by State Hy. Comn., at office of County Clerk, Eureka, sand gravel, chat or crushed stone surfacing 23.537 mi. hys. in Greenwood and Wilson Counties. W. V. Buck, Topeka, engr.

**Kentucky**—Sept. 21, by State Hy. Comn., Frankfort, bituminous mulch treatment materials application 0.447 mi. McKee-Richmond Rd., Rec. Project 30 A-1-M, Rockcastle Co.; 16.03 mi. McKee-Richmond Rd., Rec. Project 30-BM, Jackson Co.; steel superstructure, and substruc-

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†*Federal Government.*

Streets and Roads (Continued)

ture and approaches for bridge over Dix River, 0.78 mi. Danville-Lancaster Rd., N.R.H. 276 A1BG, Boyle and Garrard Counties.

**Louisiana**—Sept. 25, by State Hy. Comn., Baton Rouge, grading, surfacing 2.573 mi. hy. between Grangeville and Route 35, Project 945-B-1, N.R.S. 234, St. Helena Parish, involving 83 cu.yd. drainage and 4,800 cu.yd. roadway excav., 2,985 ft. roadway excav (alt.).

**Mass., Amesbury**—Sept. 17, by Town, Bd. Selectmen, A. E. Rice, engr., Town Hall, 14,000 sq.yd. granolithic and 2,400 sq.yd. secondary sidewalks, P.W.A. Docket 5786. $24,000.

**Mass., Boston**—Sept. 17, by City, Dpt. P. Wks., C. J. Carven, comr., City Hall Annex, sheet asphalt or bitulithic paving 1 mi. Old Colony Ave. from Dorchester Ave. to Dorchester St. To exceed $40,000. P.W.A. project.

**Mass., Boston**—Sept. 24, by City, Dpt. P. Wks., C. J. Carven, comr., City Hall Annex, sheet asphalt or bitulithic paving 1 mi. Woodrow Ave. from Blue Hill Ave. to Norfolk St., Wards 14 and 17. To exceed $40,000. P.W.A. project.

**Minnesota**—Sept. 21, by State Hy. Dpt., St. Paul, concrete paving 13,900 sq.yd. State Project 2-203-21 NRM 491-A, S.P. 2-203-22, NRM 491-B in Duluth, Central Ave. between Roosevelt St.-Cody St., and in LeSueur and Raleigh Sts. between Northern Pacific R.R. Viaduct and Central Ave.

**Miss., Greenville**—Sept 27, by Washington Co. Comn., grading, gravel surfacing, drainage structures 8.593 mi. Hollandale-Yerger Hy.; 11.548 mi. Murphy-Slaters Ferry Hy.; 5.593 mi. Winterville-Priscilla Hy., all in Washington Co. P.W.A. project.

**New Hampshire**—Sept. 20, by State Hy. Dpt., Concord, 4 in. on 5 in. gravel paving 2.104 mi. Forrest Rd., Cheshire Co., involving 8,991 cu.yd. earth and 4,305 cu.yd. rock excav. $40,000. C. P. Riford, Concord, engr.

**New Jersey**—Sept. 24, by State Hy. Comn., Trenton, rein.-con. paving 32,581 sq.yd. Route 23, Sect. 12, Packanack Lake Rd. to Pompton River, Passaic Co., incl. 73,703 cu.yd. unclassified and 7,703 cu.yd. wet excav. A. L. Grover, ch. clk.

**New York**—Sept. 25, by A. W. Brandt, comr. Hys., Albany, graveling 5.54 mi. Onondaga Co.; 6.37 mi. Steuben Co.; 2 bridges in Nassau Co.; bituminous macadam paving 0.27 mi. Chenango Co.; concrete paving 2 mi. Cortland Co.; 7.64 mi. Herkimer Co.; 4.66 mi. Madison Co.; bridges in Delaware and Jefferson Counties.

**N. Y., New York**—Sept. 20, by J. J. Lyons, pres. Bronx Boro, Bronx County Bldg., 161st St. and Concourse, grading, curbing, sidewalks, guard rails in McDonald St. from Eastchester Rd. to Stillwell Ave.

**N. Y., Sinclairville**—See "Contracts Awarded."

**N. D., Fargo**—Sept 28, by City, C. O. Jorgenson, aud., paving parts of 5th St., North and 2nd, 3rd and 4th Aves. N., in Paving Dist. 226-33, $70,000. W. P. Tarbell, city engr. Former bids rejected. Noted Aug. 15 Daily.

**Ohio**—O. W. Merrell, dir. Hys., Columbus, rejected bids Aug. 24, bituminous coated aggregate resurfacing 19.56 mi. Sects. "B," "S," "T" and "R-2," Columbus-Chillicothe Western Rd., Franklin and Pickaway Counties. $54,810.

**Pennsylvania**—Sept. 21, at office S. S. Lewis, secy. Hys., Harrisburg, widening 3,898 ft. existing rein.-con. pavement, Route 113, Sect. 12-A, Beallsville Borough, Washington Co., involving 1,070 cu.yd. Class 1 and 13 cu.yd. Class 2 excav.; rein.-con. paving, incl. rein.-con. arch and 2 plate girder underpass on 5,417 ft. R-35009, Sect. 2, city of Scranton, Lackawanna Co.; 63,080 cu.yd. Class 1, 499 cu.yd. Class 2, and 3,852 cu.yd. borrow excav.

†**Tennessee**—Sept. 21, by Pub. Rds., Dpt. Agriculture, at office Acting Superintendent Meriwether Lewis Natl. Monument, 5 mi. east of Hohenwald, on Route 20, Lewis Co., grading, surfacing 1.77 mi. roads in Meriwether Lewis Natl. Park, incl. 27,500 cu.yd. unclassified excav. H. J. Speiman, principal hy. engr.

**Virginia**—Sept. 25, by State Dpt. Hys., Richmond, bituminous paving 7,102 sq.yd. State Project NRM-1026-C1; Federal Project NRM 350-C, Route 11, Washington Co.

**Washington**—Sept. 25, by L. V. Murrow, dir. Hys., Olympia, concrete paving 1.6 mi. State Rd. 5, Tacoma, Pierce Co., incl. 11,410 cu.yd. excav.; grading 1 mi. State Rd. 5, White Pass Branch, Cortright Creek East, NRH 211-A, Lewis Co., 20,000 cu.yd. excav.; 100 ft. rein.-con. bridge with concrete girder approaches over Summit Creek, State Rd. 5, NRH 161-E, Lewis Co.; 200 ft. steel truss span with steel girder approaches over Wynoochee River and treated pile trestle and timber trestle over Sylvia Creek, on State Rd. 9, NRH 54-D, Grays Harbor Co.

**West Virginia**—Sept. 18, by State Rd. Comn., Charleston, bituminous concrete resurfacing 0.9 mi. streets in Mount Hope, State Project 3547, Fayette Co.; 1.057 mi. Beech Bottom-North Rd., P.W. 178-B, Brooke Co.; 5.986 mi. Grantsville-Brooksville Rd., Project 209-B, Calhoun Co.; concrete paving 5.122 mi. Fayetteville-Oak Hill Rd., N.R.H. and N.R.M. 173-H, Fayette Co.; 7.223 mi. Ripley-Sandyville Rd., N.R.H. 157-G-H, Jackson Co.; 0.2 mi. St. Albans streets, State Project 3549, Kanawha Co.; 8.298 mi. Bluefield-Princeton Rd., N.R.H. 200-A-B-C, Mercer Co.; 3.038 mi. St. Mary's-Belmont Rd., N.R.M. and N.R.H. 182-F, Pleasants Co.; 3.559 mi. N.R.H. 173-C, Raleigh Co.; 3.559 mi. N.R.H. 173-C, Raleigh Co.; retread surfacing 3.6 mi. Peters Run Rd., Project 5029, and 0.1 mi. Middle Wheeling Creek Rd., Project 5030; 2.5 mi. Cherry Hill Rd., State Project 5031; 2.2 mi. Roney's Point-West Union Rd., Project 5032; 1.1 mi. Stone Church Rd.-State Project 3486; 0.25 mi. Bethlehem-Elm Grove Rd., State Project 5035; 0.25 mi. Fairmont Pike; 1.9 mi. Waddles Run Rd., State Project 5034, all foregoing Ohio Co.; 9.121 mi. Point Pleasant-Leon Rd., Project 817-3250-A, Mason Co.; 6.841 mi. Williamson-Matewan Rd., Project 821-2238, Mingo Co.; 3.931 mi. Red House-Plymouth Rd., Project 819-3247-2165, Putnam Co.; 11.431 mi. Lavalette-Kenova Rd., Project 820-2176, 2201, 3348, Wayne Co.; grading, draining, graveling and arch culvert on 0.474 mi. Buckhannon Relocation, Project 36, Upshur Co.; concrete stairway, concrete floor for roadway and sidewalks, 120 ft. span rein.-con. overhead N.R.M. 197-B, Greenbrier Co. E. F. Dickson, secy.

**Wisconsin**—Sept. 25, by State Hy. Comn., Madison, concrete paving 0.738 mi. Badget Ave., Appleton-Manitowoc Rd., N.R.M. 424-I and 232 reopened, Outagamie Co.; 3.04 mi. Waupaca-Green Bay Rd., N.R.H. 435-G-1, N.R.M. 435-G-2, N.R.M. 435-H, N.R.M. 435-C, Waupaca and Outagamie Counties; 0.303 mi. 5th Ave. Rd., Antigo, S.T.H. 64, N.R.M. 518-D, Langlade Co.; grading, draining 4.484 mi. Delafield-Johnson Creek Rd., State Hy. 30, N.R.S. 5528-A, Waukesha Co., incl. 56,582 cu.yd. earth and 2,796 cu.yd. loose rock excav.; 0.954 mi. Keshena-Crandon Rd., State Trunk Hy. 55, N.R.S. 496-A, 39,820 cu.yd. earth, borrow, marsh and ditches, 1,193 cu.yd. loose rock and 597 cu.yd. solid rock excav.; 5.283 mi. Goodnow-Hazelhurst Rd., Hy. 51, N.R.H. 431-E, Oneida Co., incl. 357,103 cu.yd. earth, borrow, marsh channel, 18,432 cu.yd. loose rock and 2,303 cu.yd. solid rock excav.; 4.602 mi. Madison-Dodgeville Rd., Hy. 18, N.R.H. 156-B, Sects. 1 and 2, Dane Co., 146,831 cu.yd. earth, borrow, channel, 8,024 cu.yd. loose rock and 22,090 cu.yd. solid rock excav.; graveling 4.484 mi. Delafield-Johnson Creek Rd., N.R.S. 528-A, Waukesha Co.; grading 3.236 mi. Manitowoc-Two Rivers Rd., N.R.H. 367-B and N.R.M. 367-B, 7,733 cu.yd. earth excav.; 3.236 mi. Manitowoc-Two Rivers Rd., N.R.H. 367-B and N.R.M. 367-B, both Manitowoc Co.

**Wyoming** — Sept. 19, by State Hy. Comn., Cheyenne, grading, draining, surfacing, 4 treated timber bridges on 8.766 mi. Gillette-Arvada Rd., Campbell Co., incl. 155,900 cu.yd. unclassified and 85 cu.yd. culvert excav.; 2.72 mi. Shoshoni-Riverton Rd., Project NRH 52-A, Fremont Co., 42,860 cu.yd. unclassified (dragline) and 3,000 cu.yd. unclassified excav.; grading, draining 0.79 mi. Cheyenne-Laramie Rd., NRH 46, Laramie Co., incl. 46,400 cu.yd. unclassified excav.; grading, draining, base course surfacing, 1 treated timber bridge on 5.528 mi. Cody-Pearson Lane Rd., NRH 63, Park Co., 84,000 cu.yd. unclassified and 115 cu.yd. box culvert excav.; landscaping 0.298 mi. Cheyenne-Greeley Rd., NRH 73-A, Laramie Co., 3,350 cu.yd. unclassified excav.; drainage ditch and miscellaneous work on Kemmerer-Cokeville Rd., State Project 1168, Lincoln Co., 6,100 cu.yd. unclassified excav.; 4 I-beam spans over North Fork of Powder River on Buffalo-Kaycee Rd., Johnson Co.; 2 treated timber bridges and 2 rein.-con. culverts on Cheyenne-Torrington Rd., Laramie and Goshen Counties, incl. 1,800 cu.yd. unclassified excav.

**Ontario**—Sept. 22, by C. H. Fullerton, deputy minister Dpt. Northern Development, Parliament Bldgs., Toronto, clearing, grading 2 mi. road from Little Long Lac to Geraldton. $30,000.

## CONTRACTS AWARDED

**California**—State Hy. Comn., Marysville, C. H. Whitmore, dist. engr., bituminous surface treating 23.6 mi. hy., Placer and Nevada Counties, and 28 mi. hys. in Sacramento, Nevada and Butte Counties, to L. J. Immel, 1031 Evelyn Ave., Berkeley, $12,765 and $12,901 respectively. Bids Aug. 21, awarded Aug. 30.

**Calif., Alhambra**—City, constructing gutters, curbs, culverts in Garfield Ave. from Valley Blvd. to north city limits, involving 5,384 sacks cement, 1,660 tons rock, 960 lb. reinforcing steel, 270 ft. 20 lb. rail, 4,000 ft. 2x6, 2,000 ft. 2x8, 1,400 ft. 2x4 lumber, 12,000 sq.ft. corrugated sheet metal, 2,200 sq.ft. galvanized sheet iron, force account. Est. $36,000. C. A. Page, city engr.

†**Colorado**—Pub. Rds., Denver, fine aggregate surfacing 12.363 mi. Clear Creek and Grand Counties, to Hamilton & Gleason, Tramway Bldg., Denver, $107,000. Bids Aug. 15, awarded Aug. 30.

†**Georgia**—Pub. Rds., Dpt. Agriculture, at office Park Superintendent, Chattanooga, Tenn., constructing Ringgold-Reeds Bridge Rd., Chickamauga National Military Park, to R. B. Tyler Co., 1446 Levering St., Louisville, Ky., $63,130. Bids Aug. 31. Noted Aug. 23.

**Georgia**—State Hy. Bd., Atlanta, paving 6.599 mi. Kingsland-St. Mary's Rd., Camden Co., involving 36,307 cu.yd. excav., to Broadbent Constr. Co., Ocala, Fla., $62,798***0.697 mi. Cedartown-Rome Rd., Floyd Co., 3,696 cu.yd. earth excav., to Le Tourneau-Johnson Contractors, Rome, $26,903***4.262 mi. Newman-Atlanta Rd., Fulton and Clayton Counties, 22,979 cu.yd. earth excav., to Sam E. Finley, 292 North Ave. N.W., Atlanta, and E. A. Hudson's Sons, Bolton, $2,672***9.507 mi. Lumpkin-Cusseta Rd., Stewart Co., 324 cu.yd. earth excav., Hardaway Constr. Co., Columbus, $12,023*** grading, culvert type bridge on Tri-States R... Rabun Co., to M. R. Woodall Co., Inc., 15... Lakewood Ave. S.E., Atlanta, $72,323***wide... ing bridges, culverts and paving approaches ... bridge between Thomasville and Camilla, ... Thomasville-Albany Rd., Thomas and Mitch... Counties, 4,611 cu.yd. earth excav., to W. ... Scott, Thomasville, $29154***grading 2.179 ... Conyers-Millstead Rd., Rockdale Co., 26,018 ... yd. earth excav., to E. A. Hudson's Sons, Bolto... $23,549. Grand total $299,422. **P.W.A.** ... bids taken for paving 2.917 mi. Covington-Porterdale Rd., Newton Co.; 6.066 mi. Jackson-McDonough Rd., Butte Co.; surfacing 7.35 mi. Atlanta-Marietta Rd., Cobb Co., State may ... work themselves. Noted Aug. 16.

**Ill., Chicago**—Dpt. P. Wks. & Buildings, Div. Hys., paving 1.408 mi. Sect. 046-0304-15D, near Chicago, to Suburban Pavement & Imp... Co., 115 South Dearborn St., $153,469***0.24... mi. Sect. 051-0101-15D, near Chicago, to G. H. Summerville Co., Harvey, $10,793***1.3307 ... Sect. 145-0506-15D, near Chicago, to Milbu... Bros., Inc., Mount Prospect, $45,797***1.2755 mi. road Sect. 054-2627-15D, near Chicago, ... R. R. Anderson, 65 Kedzie St., $146,627. Grand total $356,686. Bids June 5 and July 17.

**Ill., Waukegan**—Dpt. P. Wks. & Buildings, Div. Hys., paving 1.1495 mi. Sect. 53-15D, near North Chicago, Lake Co., to S. J. Groves & Sons, Libertyville, $31,314. Bids July 30. Noted July 26.

**Ill., Waukegan**—Dpt. P. Wks. & Buildings, Div. Hys., paving 3.5072 mi. Sect. 60-15D, Lake Co., 20 ft., to S. J. Groves & Sons, Libertyville, $107,451. Bids Aug. 7.

**Indiana**—State Hy. Comn., Indianapolis, concrete paving 54,340 sq.yd. road in Allen Co., to Grace Constr. & Supply Co., Fort Wayne, $131,878 est. $175,227; grading, crushed stone surfacing 2.971 mi. Newton Co., to Heiny & Roper, Gary, $29,700 est., $39,741. Bids Aug. 21. Noted Aug. 15 Daily.

**Indiana**—State Hy. Comn., Indianapolis, brick paving 8.384 mi. Johnson Co., to J. C. O'Connor & Sons, Inc., Fort Wayne, $255,028. Est. $290,491. Bids July 31. Noted July 26.

**Indiana**—State Hy. Comn., Indianapolis, concrete paving 2,878 sq.yd. Whitley Co., to R. L. Harris, Fort Wayne, $28,175. Est. $32,654. Bids June 12. Noted June 7.

**Iowa**—State Hy. Comn., Ames, to Kelley Constr. Co., Des Moines, graveling 2.01 mi. road in Benton Co., $2,008; road in Louisa and Muscatine Counties, $2,053, in Muscatine Co. $399; 8.5 mi. Hardin Co., $672; 13.6 mi. Webster Co., $908***to Automatic Gravel Co., Muscatine, Henry and Louisa Counties, $5,330***to H. C. Young, Prairie City, road in Monroe and Wapello Counties, $1,680; 7 mi. Marshall Co., $1,365***to Hoak Constr. Co., 1007 Hubbell Bldg., Des Moines, guard rail in Clayton Co., $7,815***to Mundon & Sons, Boone, graveling 12.1 mi. Boone Co., $1,200***to Paul Constr. Co., Fort Dodge, 65.8 mi. Calhoun Co., $6,188***to Ferguson Diehl Constr. Co., Grand Junction, same road, $2,920; 15.9 mi. Carroll Co., $1,280; 28.5 mi. Greene Co., $1,453; 12.5 mi. Story Co., $700; 13.6 mi. Webster Co., $1,568***to C. A. Emery, Coon Rapids, 15.6 mi. Carroll Co., $840***to Kaser Constr. Co., Adel, 13.6 mi. Dallas Co., $1,964***to E. J. Kibbey, Carlisle, 7.5 mi. Jasper Co., $1,688*** to L. J. Peters, Des Moines, 9.1 mi. Polk Co., $1,080***to DeWees & Whitney, Marion, 14.4 mi. Tama Co., $4,500***to Ben & Sons, Sumner, 14.7 mi. Bremer Co., $2,763***to Roverud Bros., Spring Grove, Minn., 11.8 mi. Fayette Co., $4,410***to W. B. Williams, Dakota City, 13.2 mi. Kossuth Co., $2,138***to Falk & Lotzelman, St. Ansgar, 10 mi. Mitchell Co., $846. Grand total $57,507. Bids Aug. 28. Noted Aug. 23.

**Ia., Newton**—Jasper Co., gravel surfacing 2.8 mi. secondary roads, to E. F. Kibbey, Carlisle, $20,988***crushed stone surfacing 9.75 mi. road, to L. J. Peters, Des Moines, $6,450***bridge, Independence Twp., to Schroyer & Stoops, Baxter and Ames, $12,344. Grand total $39,782. Bids Sept. 6.

**Maryland**—State Roads Comn., Baltimore, sheet asphalt paving 0.53 mi. Franklin St., Contr. BC-141-72, Federal Aid Project N.R.M. 40-F, Baltimore City, to P. Flanigan & Sons, Inc., Harford Rd. and Baltimore & Ohio R.R., Baltimore, $36,160***furnishing, delivering and laying bituminous surface course 3.04 mi. Belair Rd., Contr. B-297-2-48, Federal Aid Project N.R.H. 74-A, Unit 1, Baltimore Co., to Highway Eng. and Constr. Co., 7th and T Sts., N.E., Wash., D. C., $32,688. **P.W.A.** Bids Aug. 21. Noted Aug. 16.

**Missouri**—State Hy. Dpt., Jefferson City, to Land Constr. Co., St. Joseph, oil blotter on 3.214 mi. Route 13-Route N, Sect. 1A, $3,690; 2.972 mi. Huntingtondale-Blairstown Rd., Sect. 2A, $3,338; 4.669 mi. same road Sect. 3A, $5,241; 4.964 mi. Sect. 4A, same road $5,572; all foregoing Henry Co.***to Imperial Trucking Corp. Hickman Mills, bit. mat. on 4.724 mi. Johnson Co. $15,435***to Trinidad Asphalt Paving Co., 600 South Teresa St., St. Louis, asphaltic concrete paving 1.785 mi. Iron Co., $22,724. Grand total $56,000. Bids Aug. 24.

**Missouri**—State Hy. Dpt., Jefferson City, 40 ft. concrete paving 4.082 mi. Sect. 71A and concrete widening 3.499 mi. Sect. 72A, Meramec River-Festus Rd., Jefferson Co., to Davis Constr. Co., Boonville, $200,028 and $157,227 respectively. Bids Aug. 10. Noted Aug. 2.

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†*Federal Government*

Streets and Roads (Continued)

**Missouri**—State Hy. Comn., Jefferson City, to S. G. Hayes, Jefferson City, bituminous materai surfacing 4.711 mi. Route 63, Sect. 70, Rolla-Texas Co. line Rd., Phelps Co. $15,284; 4.397 mi. Route 63, same road $13,434; 2.143 mi. Route 69A same road $6,993; 4.411 mi. Sect. 72, same road $13,484. Grand total $49,195. Bids Aug. 31.

**Nevada**—State Hy. Dpt., Carson City, constructing road in Nye Co., to G. French, Jr., Stockton, Calif., $62,365***road in Lyon Co., to Union Paving Co., Call Bldg., San Francisco, Calif., $46,909***road in Elko Co., to N. M. Bell, Berkeley, Calif., $42,929***road in Ormsby Co., to Silver State Constr. Co., Fallon, $3,814. Grand total $156,017. P.W.A. Bids Aug. 29.

**New Hampshire**—State Hy. Dpt., Concord, 3 in. bituminous macadam on 4 in. broken stone paving 1.513 mi. Suncook Valley Rd., involving 11,251 cu.yd. earth and 3,968 cu.yd. rock excav., to Hagen-Thibodeau Constr. Co., Eden Park, R. I., $55,904. Est. $73,000. Bids Aug. 23.

**N. Y., Lawrence**—Village Bd., paving 10 roadways, to J. V. Sprague Constr. Co., Arverne, $35,227. Bids Aug. 19. Noted Aug. 30.

**N. Y., Sinclairville**—Chautauqua Co., (Mayville), bitulithic paving 6 mi. Sinclairville-Moons-Cassadaga Rd., own forces, under supervision E. Fitch, Falconer, co. engr. $36,000.

**Ohio**—O. W. Merrell, dir. Hys., Columbus, brick paving, incl. furnishing, delivering brick 0.227 mi. Sect. "Massillon" (part) Akron-Massillon Rd., Stark Co., to Elmer Voght Paving Co., 846 Wellman Ave., Massillon, $24,534.

**O., Columbus**—F. D. Donnally, clk. Franklin Co., grading, draining, bituminous macadam resurfacing 4.05 mi. Fisher Rd., Prairie and Franklin Twps., 16 ft., to A. W. Burns Constr. Co., 424 Woodland Ave., $30,552. Bids Aug. 29. Noted Aug. 23.

†**Okla., Fort Sill** — Con. Q.M., excavating, hauling, filling, grading 12,605 cu.yd. earthwork, to E. W. Baker & Co., 247 Southwest 21st St., Oklahoma City, $6,807. Bids Aug. 22.

†**Pa., Middletown**—Con. Q.M., Middletown Air Depot, grading various areas, to J. C. Shawfield Co., Harrisburg, $5,583. Bids Aug. 25.

**Pa., Stoops Ferry**—R. G. Woodside, controller, Allegheny Co., Court House, Pittsburgh, grading, paving, curbing, concrete and bituminous penetration paving 5,310 ft. Stoops Ferry and Shousetown Rd., 30 ft., to D. Dinardo, 333 Boquet St., Pittsburgh, $48,485. Bids June 26. Noted June 21.

**South Carolina**—State Hy. Dpt., Columbia, bituminous surfacing 0.8 mi. Route 38, Marlboro Co., to C. G. Fuller, Barnwell, $9,091***3.3 mi. Route 19, Edgefield and Aiken Counties, to Hubbard Constr. Co., Marion, $28,514***2.4 mi. Route 6, Bamberg Co., to L. M. Gray, Gainesville, Fla., $21,772***4.2 mi. Route 21, Orangeburg, Colleton and Bamberg Counties, to J. B. Britton, Sumter, $45,285. Grand total $104,-662. P.W.A. Bids Aug. 21, awarded Aug. 31. Noted Aug. 16.

**Utah**—State Hy. Comn., Salt Lake City, scarifying and oil mixing 28.5 mi. road in Sevier, Beaver, Juab and Sanpete Counties, to J. C. Compton, McMinnville, Ore., $98,782 est. $88,000***oil processing roadbed by mix method 43.361 mi. road in Grand Co., to J. M. Sumsion, Springville, $168,000 est. $178,169*** 20.354 mi. Washington Co. and furnishing 106,-280 tons gravel surfacing for oil processing roadway 43.361 mi. road in Grand Co., to W. W. Clyde & Co., Springville, $157,537 and $45,176 respectively est. $175,000 and $55,099 respectively. Grand total $469,495. P.W.A. Bids Aug. 27, awarded Aug. 27 and 28.

**Utah** — State Rd. Comn., Salt Lake City, natural rock asphalt paving 10.802 mi. Carbon Co., to J. W. Whiting & Co., Springville, $92,194 est. $108,189***grading, graveling 0.581 mi. road in San Juan Co., to Wheelwright Constr. Co., Ogden, $17,354 est. $25,267. P.W.A. Bids Aug. 31, awarded Aug. 31.

**Wash., Tacoma**—Pierce Co., grading, surfacing 2.01 mi. McKenna-Tanwax Rd., to Harrison Bros., 1240 South C St., Tacoma, $13,009*** 2.01 mi. Eatonville Cutoff Rd., to Allen & Govan, Olympia, $17,067***grading, graveling 2.03 mi. Barney Larson Second Extension Rd., to S. R. Gray, Puyallup, $13,438. Grand total $43,514. Bids Aug. 30.

**Wash., Tacoma**—Pierce Co., Aug. 27, grading, surfacing 2.6 mi. Eatonville Cutoff Rd., from Allen & Govan, 215 B St., Olympia, $28,-647. Est. $24,694.

†**Wyoming**—Pub. Rds., Custom House, Denver, Colo., base course oiling 35.95 mi. road in Teton and Sublette Counties, to Hoops Constr. Co., Twin Falls, Idaho, $56,365. P.W.A. Bids Aug. 15.

**Ont., Hamilton**—Dpt. Hys., Parliament Bldgs., Toronto, asphaltic concrete paving 3.6 mi. Hamilton Entrance 1st Bridge Easterly, Contr. 34-53, to A. Cope & Sons Ltd., 19 Albert St., about $75,000.

†**P. R., San Juan**—U. S. Eng., constructing Cayey-Cidra portion of Insular Road, to R. R. Prann, San Juan, $65,491. Bids Aug. 13.

*†Federal Government.*

## EARTHWORK, IRRIGATION DRAINAGE AND WATERWAYS

### PROPOSED WORK

**Calif., Redwood City**—San Mateo Co. Harbor Comn. defeated $450,000 bonds to procure P.W.A. loan and grant for harbor improvements, incl. wharves, warehouses, spur tracks, channel and turning basin. Total $635,000. Federal participation to a total of $185,000 is expected. Noted Aug. 2.

**Md., Annapolis**—Comrs. Anne Arundel Co., Courthouse, plans constructing 5 sections of bulkheads to be built at Mason's Beach, Franklin Manor, Arundel on the Bay, Bay Bridge and Riviera Beach, $200,000. **Maturity this fall.** J. A. Bromley, Annapolis, engr.

†**Mich., Benton Harbor**—U. S. Eng., Milwaukee, Wis., plans dredging turning basin at Benton Harbor.

†**Tenn., Pickwick Landing**—U. S. Eng., 323 Post Office Bldg., Nashville, preparing specifications constructing lock, lock chamber, 110 ft. wide with clear length of 600 ft. and lift will be approximately 61 ft. $3,000,000-$4,000,000.

†**Ore., Portland**—U. S. Eng., Post Office Bldg., soon takes bids dredging 750,000 cu.yd. Duwamish Channel. Former bids rejected.

### BIDS ASKED

†**Fla., Moore Haven**—Oct. 1, by U. S. Eng., Jacksonville, constructing Hurricane Gate and Lock Structure on Lake Okeechobee.

†**Illinois**—Sept. 27, by U. S. Eng., 932 Post Office Bldg., Canal and Van Buren Sts., dredging 413,160 cu.yd. in Illinois River between Mile 113.2 near Bath and Mile 229.3 near Utica; 377,040 cu.yd. between Mile 11.2 between Grafton and Hardin and Mile 112.7 near Bath.

**Maryland**—Sept. 18, by Com. of Anne Arundel Co., Court House, Annapolis, 8,100 ft. timber bulkhead at North Beach; 1,600 ft. timber bulkhead, Fairhaven. J. A. Bromley, Court House, Annapolis, engr.

†**Mass., Boston**—Sept. 17, by U. S. Eng., Custom House, Boston, repairing and extending concrete seawall, at Great Brewster Island, Boston Harbor.

†**New York and New Jersey**—Sept. 21, by U. S. Eng., 39 Whitehall St., New York, dredging and rock removal in Hudson River Channel.

†**Tenn., Knoxville**—Sept. 20, by Tennessee Valley Authority, structural steel for stop log guides for Wheeler Dam Spillway for 62 gate openings; furnishing, fabricating and delivering seat frames and bronze liners, complete with anchor rods 24 turbine draft tube bulkhead gates for Wheeler Power Plant. C. H. Garity, dir. Purchaser.

†**Tex., Houston**—U. S. Eng., Galveston, will start receiving bids about Sept. 12, dredging Houston Ship Channel. $1,043,000. P.W.A. financed. Plans nearing completion.

†**West Virginia**—Oct. 8, by U. S. Eng., Coal Exch. Bldg., Huntington, maintenance dredging 59,000 cu.yd. material from dredged channel, in Ohio River, below U. S. Lock 16.

†**Wis., Trempealeau**—Oct. 2, by U. S. Eng., 615 Commerce Bldg., St. Paul, Minn., constructing Dam 6, Mississippi River.

### LOW BIDDERS

†**Ga., Augusta**—U. S. Eng., Savannah, Aug. 31, completing major portion lock and dam on Savannah River below here, from Arundel Corp., foot Pratt St., Baltimore, Md., $977,309. Est. $1,775,000. Noted Aug. 9.

### CONTRACTS AWARDED

†**Ark., Manila**—Dpt. Agriculture, Wash., D. C., constructing earthfills and embankments, timber spillways and ditches, to Gerald Smith Constr. Co., Memphis, Tenn. Est. $40,000. Bids Aug. 14. Noted July 26.

†**Connecticut** — Superintendent Lighthouses, St. George, N. Y., rip rap stone around base of Scotch Cap Light 1 and Bartlett Point Light 5, Proposal 46801, to Merritt, Chapman & Scott Corp., 17 Battery Pl., New York, N. Y., at $1.93 per ton. Bids Aug. 2.

†**Mich., Port Huron**—U. S. Eng., Detroit, dredging 12,000 cu.yd. material from upper Black River in turning basin to improve channel depths, to R. C. Hoffman Constr. Co., Terminal Tower Bldg., Cleveland, O. at 43c. per cu.yd., total $5,160. Bids Aug. 30. Noted Aug. 23.

†**Mississippi and Louisiana**—U. S. Eng., Vicksburg, Miss., constructing 556,000 cu.yd. earthwork on west bank Mississippi River in Louisiana, to Hardwick & Horton, 1302 Sterick Bldg., Memphis, Tenn., at 16.3c. per cu.yd.; 1,708,300 cu.yd. earthwork on east bank Mississippi River in Mississippi, to Sternberg Dredging Co., Arcade Bldg., St. Louis, Mo., 13.5c. per cu.yd. Bids Aug. 23. Noted Aug. 9.

†**Missouri** — U. S. Eng., Rock Island, Ill., restoring levee of H. A. Wehrman Levee on North Fabius River, Lyons Twp., Lewis Co., to L. E. Tillman, Hull, Ill., $3,696. Bids Aug. 24.

**Tex., Brownsville**—Brownsville Navigation Dist., c/o W. G. Willmann, chn., Brownsville, furnishing, laying 7,600 lin.ft. 12 in. main, and 6,700 ft. 12 in. main, for terminal facilities, to Sherman Machine & Iron Wks., 18 East Main St., Oklahoma City, Okla., $121,246 (tentative award); laying 24,000 lin.ft. 16 in. c.i. mains, to Ulen Constr. Co., 38 South Dearborn St., Chicago, Ill., $132,715 (tentative award). P.W.A. Bids Aug. 13.

†**Wisconsin**—U. S. Eng., Milwaukee, furnishing lock gates, structural steel for De Pere Lock, to Graver Tank & Mfg. Co., East Chicago, Ind., $15,865. Bids Aug. 24.

†**Wis., Fountain City**—U. S. Eng., 615 Commerce Bldg., St. Paul, Minn., to Webster Lumber Co., 2522 Como Ave. W., St. Paul, Minn., pool clearing 2,120 acres at Lock and Dam 5, $53,206***to A. Johnson Constr. Co., Wesley Temple Bldg., Minneapolis, Minn., 3,139 acres $115,160***to Nevada Constr. Co., Nevada, Mo., 1,589 acres, $23,465; 1,425 acres, $47,480; 1,136 acres, $40,842. Grand total $280,222. Bids Aug. 8. Noted Aug. 2.

**B. C., Powell River**—Powell River Co. Ltd., log crib dam, 600 ft., maximum height of 30 ft. to store water on Lois River Watershed, to Stuart Cameron & Co. Ltd., 675 West Hastings St., Vancouver, $100,000.

**Ont., Owen Sound**—Secretary Dpt. P. Wks., Ottawa, extending revetment wall and dredging, to Hilband Sibald, Ltd., St. Catherines, $27,251. Est. $40,000. Bids Aug. 15.

**Que., Louiseville**—Secretary, Dpt. P. Wks., Ottawa, Ont., dredging 71,800 cu.yd. sand and clay, to St. Francis River Dredging Co., Quebec, Que., $19,380. Est. $26,500.

**Que., Riviere St. Francois**—Secretary Dpt. P. Wks., Ottawa, Ont., dredging 84,734 cu.yd. sand and gravel, to Commina Constr. Co. Ltd., Montebello, $13,346. Est. $32,000. Bids Aug. 21. K. M. Cameron, Dpt. P. Wks., Ottawa, Ont., engr.

### FEDERAL POWER COMMISSION

Applications for License and Permits Licenses

1285—Southern California Edison Co. Ltd., 601 West 5th St., Los Angeles, wants license constructed transmission line affecting public lands in Kern Co.

1286—B. C. Alaska Mines American, Inc., Ketchikan, Alaska, preliminary permit power project on Tunnel Creek, Prince of Wales Island, Alaska, affecting lands in Tongass National Forest.

1287—Southern California Edison Co. Ltd., 601 West 5th St., Los Angeles, Calif., wants license constructed transmission line in San Bernardino Co. affecting lands in San Bernardino Natl. Forest.

1288—Canyon Mines Corp., 144 Kearney St., San Francisco, Calif., wants license constructed transmission line affecting lands in Tahoe Natl. Forest.

1289—H. L. Kerr, Winlock, Wash., wants license power project on Hager Creek, Lewis Co. affecting lands in Columbia Natl. Forest.

## UNCLASSIFIED

### PROPOSED WORK

**Calif., San Francisco**—SCALE and PIT—Bauer Schweitzer Hop & Malt Co., 660 Sacramento St., making plans foundation and pit and installing 50 ft. railroad track scale, W. E. Murray, 908 Hayes St., engr.

**Ill., Chicago**—TUNNELS and BATHHOUSE—Lincoln Park Comrs., Center and Clark Sts., plans 3 tunnels and three 1 story bathhouses at Oak St. Lake Front, $125,000. H. E. Young, 208 Washington St., archt. Chicago Plan Comn., 208 Washington St., archt.

**Ill., Maywood**—SWIMMING POOL—Cook Co. Forest Preserve Comrs., 547 County Bldg., Chicago, plans constructing swimming pool on Des Plaines River, Madison to Washington Sts. P.W.A. Fund application made. E. C. Hall, 123 West Madison St., Chicago, archt.

**Mich., Detroit**—TRAFFIC CONTROL—City, Police Dpt., Police Headquarters, plans traffic control on Woodward Ave., when widening is completed, incl. purchase and installation of 13,300 ft. 5 conductor cable, fourteen 220 volt secondary traffic timers, fourteen 6- to 4-in. extra heavy pipe reducing couplings, 58 two-way adjustable traffic signals, fourteen 6 in. c.i. ring, 14 pcs. of 6 in. steel pipe 8 ft. long, 14 pcs. 4 in. steel pipe 54 in. long, 14 automatic time switches, 10 malleable iron brackets, 360 traffic signal lights, 230 volt, 8,000 metal pavement markers for cross walks and 18,000 metal pavement markers for traffic lanes, 68 stop street signs, reflector button type. $25,000.

**New York**—GAS PIPE LINE—Empire Gas & Fuel Co., 78 North Main St., Wellsville, plans constructing 8 mi. 4 in. gas pipe line from Greenwood to connect with feed line of Hornell Gas Light Co., Hornell. Also in market 8 mi. pipe and connections. To exceed $17,750. H. Bradley, Wellsville, pres.

**N. Y., Brooklyn**—RECREATION BUILDINGS—Dpt. Parks, Arsenal Bldg., Central Park, New York, soon takes bids recreation buildings at Riverdale and Snediker Aves. F. F. Pannaman, c/o owner, archt.

**N. Y., Brooklyn**—SWIMMING POOL—Dpt. Parks, Arsenal Bldg., Central Park, New York, plans by A. Embury, c/o owner, swimming pool, Blake and Euclid Aves. $40,000. **Maturity later.**

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Unclassified (Continued)

**N. Y., Jamestown**—STADIUM—Bd. Educ., F. P. Rogers, secy., 4th and Spring Sts., plans constructing municipal stadium. **Maturity sometime in 1935.** $40,000 or more. L. F. Graham, city engr.

**N. Y., New York**—RECREATION BUILDING—Dpt. Parks, Arsenal Bldg., Central Park, soon takes bids recreation building, Park Ave. and Taaffe Pl. A Embury, c/o owner, archt.

**N. Y., New York**—RECREATION BUILDING and COMFORT STATION—Dpt. Parks, Arsenal Bldg., Central Park, plans by A. Embury, c/o owner, recreation building, comfort station, Baxter and Mulberry Sts. $28,000.

**N. Y., New York**—SWIMMING POOL—Dpt. Parks, Arsenal Bldg., Central Park, plans by A. Embury, c/o owner, swimming pool, 11th Ave., 53rd St., at DeWitt Clinton Park. $40,000 or more. **Maturity later.**

**North Carolina**—TOWERS and TELEPHONE LINES—State Dpt. Conservation & Development, Raleigh, F. H. Claridge, in charge, plans 40 steel towers ranging in height from 45 to 100 ft., to be erected in Wilkes, Buncombe, Wayne, Moore, Halifax, Polk, Harnett, Bertie, Transylvania and Wilson Counties. These forest look-out towers to be connected by telephone to ground fire forces of various counties. Also 144 mi. of telephone lines will be constructed. State will erect approximately 100 more towers in near future.

**N. C., Morehead City**—PORT TERMINAL—Morehead City Port Terminal, plans completed by J. E. Greiner Co., 1201 St. Paul St., Baltimore, Md., and same will be submitted to Port Comn. for approval for port terminal, $450,000. P.W.A. project. Noted July 19.

†**South Carolina**—PARKS—National Park Service, Wash., D. C., plans developing parks in Aiken, Georgetown, Colleton, Sumter and Dorchester Counties, incl. dams at Cheraw, Aiken and Poinsett Parks. H. A. Smith, Columbia, state forester. **Maturity about Oct. 1.**

**Alta., Blairmore**—LIGHTING SYSTEM—Town bids this year complete electric lighting system.

### BIDS ASKED

†**Ill., Danville**—ELECTRICAL DISTRIBUTION SYSTEM—Sept. 25, by Vet. Bu., Arlington Bldg., Wash., D. C., electrical distribution system, at Veterans Administration Facility.

**La., New Orleans** — PLAYGROUND — See "Contracts Awarded."

**La., Zachary**—GAS DISTRIBUTION SYSTEM—Sept. 29, by City, constructing gas distribution system, incl. 39,920 lin.ft. 2 in. and 6,150 lin.ft. 1 in. pipe with welded joints in place, 150 service connections, 75 service cocks, forty-three 2 in. valves and 43 valve boxes in place, 75 meters and 75 regulators installed; 150 lin.ft. railroad crossing. S. E. Huey, Monroe, engr.

**New York**—CONNECTIONS, TRACK BONDING, etc.—Sept. 28, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, furnishing, installing d.c. connections and track bonding for part Independent City-owned Rapid Transit Railroad from Concord and Jay Sts., Brooklyn Boro, to 6th Ave. and Waverly Pl., Manhattan Boro; furnishing, installing drainage equipment for Line A from Court St. to Rockaway Ave. and Line B from 6th Ave. to Concord St., in Manhattan and Brooklyn Boros; installing ventilation equipment for Line A from Hoyt to Court Sts. to Rockaway Ave. and for Line B from 6th Ave. to Fulton St., Manhattan and Brooklyn Boros.

**O. East Cleveland**—YARD LIGHTING, etc.—See "Public Buildings."

†**Tenn., Chattanooga**—SHELTER HOUSE, etc.—Sept. 20, by National Park System, Dpt. Interior, Wash., D. C., shelter house, comfort station, partial demolition of and repairing and additions to existing stone wall of cemetery at Chattanooga Natl. Cemetery.

**B. C., Nelson**—POWER LINE—See "Contracts Awarded."

### CONTRACTS AWARDED

**California**—PIPE LINE—Standard Oil Co., Standard Oil Bldg., San Francisco, taking up 108 mi. 12 in. steel pipe on Bakersfield-Richmond pipe line, incl. uncovering, cutting into 20 and 40 ft. lengths, removing protective treatment and hauling to Kettleman Hills Reclamation plant, pipe is to be used in construction of new line from Rio Bravo to Estero, to Bechtel-Kaiser Co. Ltd., 155 Sansome St., San Francisco. Awarded Aug. 30. Noted Aug. 30.

**La., New Orleans**—PLAYGROUND—City preparing plans playground on Lafitte Ave., incl. wading pools, volley ball courts, swings, brick building for office and lavatory and basketball court. City will do work with FERA labor. $35,000. M. H. Goldstein, American Bank Bldg., engr.

**Miss., Gulfport** — PIER, etc. — J. R. Dent, pres., Gulfport Port Comn., Div. 1 substructure, 1 story, 122x1,760 brick, steel, rein.con. pier and warehouse and auxiliary improvements on west side of Gulfport Harbor, to F. Gaines, Fairland, Okla., base bid $620,000•••Div. 2, superstructure, Div. 3, roofing, Div. 4, water supply, plumbing and fire protection, Div. 6, hydraulic fill, railroad tracks, roadway and approaches, to Williams Bros., Inc., Exchange Bank Bldg., Tulsa, Okla., $337,631•••Div. 5, electrical installation, to Gates Electric Co., Gulfport, $10,835•••Div. 8, office building, to S. Bailey, Gulfport, $3,650. Grand total $972,116. Bids Aug. 30. Noted Aug. 9.

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**Pennsylvania and New Jersey** — CONCRETE DECK, etc. — Delaware River Bridge Comn., Bridge Plaza, Camden, N. J., 6,650 lin.ft. single track concrete deck on existing steel framework of Delaware River Bridge high speed line, Contr. 4, to Turner Constr. Co., Architects Bldg., Phila., Pa., $77,234; furnishing, erecting power rectifier equipment and switch gear in Philadelphia, Pa., and Camden, N. J., substations, Contr. 5, to Allis-Chalmers Co., 1126 South 70th St., Milwaukee, Wis., $393,965. **P.W.A.** Bids Aug. 10.

**B. C., Nelson**—POWER LINE—City, City Hall, constructing power line from Bonnington Falls to City's substation, force account. Bids being called for materials as soon as specifications are complete, incl. poles, cross-arms, and fittings, etc. Est. $35,000. R. E. Potter, City Hall, city engr.

## MATERIALS AND EQUIPMENT

### PROPOSED WORK

WATERWORKS MATERIALS—**Upland, Calif.**—See "Waterworks."

BRICK—**Chicago, Ill.**—Dpt. P. Wks., City Hall, rejected bids Aug. 8, 500,000 common brick. Noted Aug. 2.

SPECIAL CASTINGS—**Chicago, Ill.**—Dpt. P. Wks., City Hall, rejected bids Aug. 16, special castings.

†GRAVEL—**Montana**—U. S. Eng., Kansas City, Mo., received no bids Aug. 30, 6,000 cu.yd. gravel for ballast for land booster car tracks at Fort Peck Dam.

OIL and GASOLINE STORAGE TANKS — **Syracuse, N. Y.**—Colonial Beacon Oil Co., 20 Providence St., Boston, Mass., plans oil and gasoline storage tanks, incl. concrete foundations, Solar St. $35,000. Private plans.

### BIDS ASKED

DUMP CARS—**Los Angeles, Calif.**—Sept. 24, by D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Bway., furnishing, delivering 110 dump cars, mine, 70 cu.ft. capacity, **(a)** f.o.b. cars bidder's shipping point, each **(b)** f.o.b. cars or trucks, 410 Ducommun St., Los Angeles, each **(c)** f.o.b. cars Lone Pine, each; Spec. 1504. To exceed $2,000.

†DONKEY BOILER—**Sacramento, Calif.**—U. S. Eng., Post Office Bldg., Sacramento, taking bids 1 vertical fire tube, donkey boiler, complete with accessories and fittings, Spec. 6690.

CRUSHED AGGREGATE, etc. — **Indiana** — Sept. 21, by State Hy. Comn., Indianapolis, 300-500 tons stone, crushed aggregate or slag, f.o.b. Rolling Prairie; 800 wood guide posts, f.o.b. Wabash; 2 DeVilbiss electric exhaust fans, f.o.b. Valparaiso and LaPorte; 1 steel parts bins, f.o.b. Warsaw; 1 steel storage bins, f.o.b. Petersburg; 1 steel parts bins, f.o.b. Waterloo; 1 steel parts bins, f.o.b. Lipton; automobile parts, f.o.b. Indianapolis; truck parts and hardware, f.o.b. Indianapolis. J. D. Adams, chn.

ROAD OIL—**Indiana**—Sept. 19, by J. D. Adams, chn. State Hy. Comn., Indianapolis, 134,400 gal. road oil "A." for Seymour Dist.; 800-1,100 tons No. 4 crushed aggregate on Rd. 45N; 1,000 tons No. 4 crushed aggregate on State Rd. 33; 1 storage tank, at Petersburg.

†SWITCHING EQUIPMENT — **Boulder City, Nev.** — Oct. 10, by Bureau Reclamation, Denver, Colo., 2300 volt switching equipment: four 287.5 kilovolt 3-cycle oil circuit breakers; four 287.5 kilovolt, outdoor type, lightning arresters; twelve 287.5 kilovolt 1220-ampere 3-pole, motor-operated, disconnecting switches, one 4,000 ampere 23,000 volt bus structure with current transformers, one 2,000 ampere 23,000 volt bus structure, with current transformers; four 600 ampere, 15,000 volt oil circuit breakers; three neutral grounding reactors, with cubicles for installation in Boulder Power Plant, Boulder Canyon Project, Arizona-California-Nevada, Spec. 589. E. Mead, comr.

†CABLE — **Brooklyn, N. Y.** — Sept. 24, by Signal Supply Office Army Base, 58th St. and 1st Ave., 31,900 ft. cable.

GRADERS—**Syracuse, N. Y.**—Onondaga Co., O. S. Crane, purch. agt., taking bids 2 motor graders for County Hy Dpt. $9,253.

PUMPS, etc.—**Cleveland, O.**—Sept. 21 (extended date), one twin unit, two stage steam jet air ejector, 4 water turbine driven oil pumps, and 3 centrifugal oil separators.

†BUCKET, etc.—**Huntington, W. Va.**—Sept. 19, by U. S. Eng., concrete bucket with controllable central discharge bottom dump and not less than 1 cu.yd. capacity for U. S. Lock 14, Ohio River.

†SAND and GRAVEL—**Huntington, W. Va.**—Sept. 19, by U. S. Eng., 1,000 tons washed sand and 2,000 tons washed gravel for U. S. Lock 14, Ohio River.

TURBO-GENERATOR, etc.—**Manitowoc, Wis.**—Sept. 27, by Public Utilities Comn., 5,000 kw steam turbo-generator, condenser, and auxiliary equipment. Noted July 12, under "Public Buildings."

CENTRIFUGAL PUMP—**Winnipeg, Man.**—Sept. 17, by Chairman Public Utilities Comn., centrifugal pump to be directly coupled to variable speed electric motor.

PUMPS, etc.—**Quebec City, Que.**—Emond & Cote, Crown St., in market for 3 pumps and gasoline tanks.

### CONTRACTS AWARDED

**PIPE—Alhambra, Calif.**—City Comn., 3,430 ft. 16 in. 10 ga. and 192 ft. 12 in. 12 ga. pipe, to Southern Pipe & Casing Co., Azusa, $5,199. Est. exceeds $4,500. Bids Aug. 21, awarded Aug. 27.

**CAST IRON PIPE—Eureka, Calif.**—J. Griffith,, city supt. P. Wks., 5,500 ft. 8 in. Class B or mono cast or centrifugal cast B and S c.i. water pipe, delivery f.o.b. docks, Eureka, to Eureka Boiler & Steel Products Co., foot of T St., $5,583. Bids Aug. 21, awarded Aug. 27.

**TRUCK BODIES—Fresno, Calif.**—City Council, 9 truck bodies for use on trucks of Waste Disposal Department, to Western Pipe & Steel Co., Fresno, $3,042 (installed). Bids Aug. 16, awarded Sept. 4.

**STORAGE BATTERY—Los Angeles, Calif.**—D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Bway., furnishing, delivering 1 lead-acid type storage battery complete, filled with electrolyte cells assembled, all connections, Spec. 1449, to Electric Storage Battery Co., 341 West 18th St., $2,720. Bids July 5, awarded Aug. 28. Noted June 21.

†**GENERATING SET—Jacksonville, Fla.**—U. S. Eng., furnishing generating set, to Fairbanks-Morse Co., 900 South Wabash Ave., Chicago, Ill., $17,439.

**STONE BALLAST—Indiana**—Indiana State Hy. Comn., Indianapolis, 18,000 tons stone ballast for subway of New York Central R.R. at South Bend; to National Stone Co., Joliet, Ill., $9,000. Bids July 25. Noted July 19.

†**WINCHES—Annapolis, Md.**—Yards & Docks, Navy Dpt., Wash., D. C., winches, etc., Spec. 7735, to Roland Electric Co., 418 East Pratt St., Baltimore, $25,000. Bids Aug. 29. Noted Aug. 23.

**PIPE—Boston, Mass.**—Commonwealth of Massachusetts, Metropolitan Dist. Comn., D. B. Keniston, comr., 20 Somerset St., Boston, 271 lin.ft. 42 in. electric welded steel water pipe with rolled flanges, 507 lin.ft. 42 in. and 729 lin.ft. 48 in. electric welded steel water pipe with ends sub-punched for riveted joints, to Farrar & Trefts, 20 Millburn St., Buffalo, N. Y., $18,848. Bids Aug. 23, awarded Aug. 31. Noted Aug. 23.

**GRAVEL—Lynn, Mass.**—City, City Clerk, City Hall, 5,000 cu.yd. gravel, to M. McDonough Co., Saugus, at 37½c. per cu.yd. Noted Aug. 9.

**BITUMINOUS MATERIAL, etc.—Reading, Mass.**—Town, Bd. P. Wks., Municipal Bldg., 25,000 gal. bituminous material, to Standard Oil Co. of New York, 31 St. James Ave., Boston; 2,700 tons coarse stone and 300 tons pea stone, to Malden Crushed Stone Co., Broadway, Malden.

**CENTRIFUGAL PUMP—Sharon, Mass.**—Town, Bd. Water Comr., Town House, electric motor driven centrifugal pump for Moose Hill Pumping Station 2, to Turbine Equipment Co. of N.E., 80 Federal St., Boston, $2,795. Bids Aug. 22, awarded Aug. 30.

†**CEMENT—Grand Haven, Mich.**—U. S. Eng., Milwaukee, Wis., furnishing 1,600 bbl. cement delivered here, to Huron Portland Cement Co., 161 West Wisconsin St., Milwaukee, Wis., $3,936. Bids Sept. 1, awarded Sept. 4.

**PUMP—Grand Rapids, Minn.**—Water, Light, Power & Building Comn., F. W. McIver, secy., furnishing, delivering 1 vertical turbine deep-well pump, to Fairbanks Morse & Co., Park Sq., St. Paul, $1,626. **P.W.A.** Bids Aug. 10.

**LUMBER—Minneapolis, Minn.**—City, F. S. Gram, purch. agt., to Wheeler Lumber, Bridge & Supply Co., Lumber Exch., 114,667 bd. ft. rough pine in 16 ft. lengths, 2x8 at $28.50 per M; 3x12 at $33.25; and 8x8 $32.35. Total $3,492. Bids Aug. 28.

†**WIRE ROPE—Vicksburg, Miss.**—U. S. Eng., to New York Cordage & Cable Co., Inc., 162 South St., New York, N. Y., wire rope, Lot 1, $15,812; Tiller rope, Lot 2, $743; and marline covered wire rope, Lot 3, $3,404. Grand total $19,959. Bids July 31.

†**GRAVEL—Kansas City, Mo.**—U. S. Eng., 8,000 cu.yd. gravel for railroad ballast, to J. L. Shiely Co., 1089 Snell Ave., St. Paul, Minn., $6,000. Bids Aug. 6. Noted July 26.

**PIPE—New York, N. Y.**—Dpt. Purchase, Municipal Bldg., 1,675 tons pipe and fittings, to U. S. Pipe & Fdry. Co., 71 Bway.•••575 tons, to Donaldson Iron Wks., 253 Bway.•••1,215 tons, to R. D. Wood & Co., Phila., Pa. (Florence Pipe Fdry. subsidiary). Bids Aug. 20. Noted Aug. 16.

†**VALVES—Pittsburgh, Pa.**—U. S. Eng., Keenan Bldg., butterfly valves for use in repairing Monongahela River locks, to Marion Machine, Fdry. & Supply Co., Scottdale, Pa., $7,450.

†*Federal Government.*

Materials, etc. (Continued)

†**CULVERT PIPE—Milwaukee, Wis.**—U. S. Forest Service, culvert pipe, to Felker Bros. Mfg. Co., **Marshfield**, 1,416; and to H. V. Johnston Culvert Co., 1729 Northeast Bway., Minneapolis, Minn., $3,427.

## FOREIGN

**Argentine, Buenos Aires** — Oct. 1, by Argentine State Railways Bd., supplying 2 electrically operated turntables for 1,435 mm gauge, 25 meters, in diam. and suitable for loading up to 150 tons maximum.

**Australia** — Oct. 11, by Townsville Town Clerk, supplying 1,000 kw. self-contained turbo-alternator complete with exciter auxiliary plant, instruments and fittings•••Oct. 17, by Chairman Victoria Railway Comn., **Melbourne,** supplying selector telephone equipment consisting of control panel and 13 radiating lines.

**China, Hong Kong**—Bishop & Lacy Ltd., P. O. Box 103, Exchange Bldg., in market for 15 tons galvanized sheets 7x3 ft. 24 sheets per 224 lbs. and 10 ton galvanized wire 18/22 gage, in catchweight coils of 112 lbs.

**East Africa**—Oct. 15, by Port & Railway Administration, supplying 1 gas producer, motor alternator and distribution board; Sept. 24, for supply 3 light railway cars for 4 passengers; Oct. 25, for supply 4 locomotives and tenders with accessories, at Lourenco Marques, Portuguese, East Africa.

**Egypt, Cairo**—Oct. 16, by Ministry of Interior, electrical substation equipment and transmission and distribution lines for town of Tima.

**England**—Oct. 3, by President Boro Council, supplying and erecting sulphur and grit extraction plant to deal with gases from 6 water tube boilers, each having evaporation of 260,000 lb. steam per hr. in **Fulham,** Preece, Cardeau & Rector, 10 Queen Anne Gate, Westminster, London, engrs.•••**Tipton** Urban District Council bids in September constructing 600 houses $840,000 •••Surrey Co. Council, **Kingston-on-Thames,** making plans county hall $650,000•••W. G. West preparing plans erecting 300 houses in **Stockport** $540,000•••**Liverpool** bids in September for public baths, $585,415•••**Lindsey,** plans by County Engineer, constructing By-Pass Rd. in Bragg Dist. of Lincolnshire, $1,000,000.

**England, London**—Southern Railway making plans electrification of lines in London area and Eastbourne, Bexhill and Hastings. $11,000,000.

**Irish Free State, Galway** — Municipality awarded contract constructing college to James Stewart & Sons, Galway, $510,000.

**New Zealand, Wellington**—Nov. 27, by Secretary Public Wks., Supplies & Tenders, two 24,000 kva. generators and two 30,000 hp. water turbines.

**Panama, Puerto Armuelles**—United Fruit Co., Boston, Mass., plans docks and terminal to replace facilities destroyed in earthquake. Est. about $300,000. **Maturity indefinite.**

**Scotland**—J. Brocklehouse & Co. Ltd., Birmingham, England, plans constructing large plant to manufacture light trailers, general iron and steel work in **Glasgow**•••Corporation of Glasgow making plans steel, ferro concrete bridge over River Clyde, in **Glasgow,** $10,000,000••• **Aberdeen** Educ. Com. voted $921,250 for school extension•••Ayrshire Co. Council, **Ayr,** voted $1,288,125 for constructing 792 houses.

## PUBLIC BUILDINGS

**PROPOSED WORK**

†**Ala., Huntersville**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans constructing U. S. Post Office, Jefferson and Adams Sts., $176,000. Bids this week for site.

†**Calif., San Francisco**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans purchasing site for U. S. Mint.

**Calif., San Francisco**—City and San Francisco Co., plan rebuilding Girls High School, Geary and Scott Sts. Contract formerly awarded to C. L. Wold, 416 Fulton St., but building was destroyed by fire during construction. Noted May 31, under "Contracts Awarded."

†**Conn., New Milford**—Treas. Dpt. at office Sup. Archt., Wash., D. C., making plans 1 story, basement, brick, stone post office, Main St. $70,000. Site selected.

†**Fla., Perry** — Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected.

†**Ga., Covington**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected.

†**Ill., Chicago** — Treas. Dpt. at office Sup. Archt., Wash., D. C., plans Jefferson and Lincoln Park Postal Stations. Sites selected.

†**Ill., Galesburg**—Twenty-First Forestry Camp, Jefferson Barracks, Mo., rejected bids Aug. 21, constructing kitchen and mess building, 1 bathhouse, 2 latrines, headquarters building, 6 barracks buildings, first-aid building, pump and power house, garage, forestry office and quarters and warehouse at Camp Galesburg. Noted Aug. 17 Daily.

†**Ind., Columbia City**—Treas. Dpt. at office Sup. Archt., Wash., D. C., making plans U. S. Post Office. Site purchased.

†*Federal Government.*

†**Ind., Nappanee**—Treas. Dpt. at office Sup. Archt., Wash., D. C., making plans U. S. Post Office. Site purchased.

†**Ind., Tipton** — Treas. Dpt. at office Sup. Archt., Wash., D. C., making plans U. S. Post Office. Site purchased.

†**Ia., Sac City**—Treas. Dpt. at office Sup. Archt., Wash., D. C., rejected bids Aug. 30, brick, concrete post office, $42,800. Noted Aug. 9.

†**La., DeRidder** — Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected.

†**Me., Westbrook**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected. Noted July 19.

†**Mass., Arlington**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected.

**Mass., Boston**—City, Dpt. School Buildings, W. W. Drummey, supt. Constr., 11 Beacon St., rejected bids Aug. 30, 2 story, basement, 60x120 ft. elementary school, Beethoven Dist. on Baker St. H. H. Atwood, 61 Alban St., Dorchester, archt. Noted Aug. 16.

†**Mass., Dedham**—Treas. Dpt. at Office Sup. Archt., Wash., D. C., rejected bids Aug. 15, 1 story, basement post office, High St. and Maple Pl. Will readvertise. Noted Aug. 2.

**Mass., Haverhill**—City, G. E. Dalrymple, mayor, bids in November, 2 and 3 story, brick, steel hospital addition, incl. nurses home and service, $130,000. C. V. Badger, Lamoille Ave., New Bedford, archt. Noted Jan. 18.

**Mass., Lowell**—City, C. L. Slowey, mayor, City Hall, plans by H. L. Rourke, 45 Merrimack St., rebuilding brick, steel fire-damaged school, Sycamore St., Oakland Dist. $125,000. P.W.A. project. Noted Jan. 4.

**Mich., East Lansing**—Bd. Educ. plans by Lane, Davenport, Inc., 610 Donovan Bldg., Detroit, 2 story, basement, 68x100 ft., brick, steel, rein.-con. school, incl. classrooms, auditorium and gymnasium, plain found. $105,000.

**Mich., Kalamazoo**—Kalamazoo Co. plans by Le Roy & Newlander, Kalamazoo, 4 story, basement, brick, steel, rein.-con. court house, plain found. $750,000. Election Sept. 18 to vote on $565,000 bond issue for security for P.W.A. loan. Noted Aug. 9.

†**Miss., Bay St. Louis**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected.

**Mo., Farmington**—City making plans municipal light and power plant and distribution system. $141,000 loan and grant allotted by P.W.A. A. L. Mullergren Co., 202 Fairfax Bldg., Kansas City, engrs. Noted Jan. 4.

†**Mont., Dillon**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected.

†**N. J., Morristown**—Dpt. Interior, Wash., D. C., plans by John Russell Pope, 542 5th Ave., New York, and takes bids in late fall, museum at Morristown Natl. Park. $200,000.

**N. J., Plainfield**—City plans by W. S. Bessell, 65 5th Ave., New York, 2 story, basement, 100x105 ft. auditorium, 50x80 ft., 46x122 ft. and 54x56 ft. school building units, brick, steel, plain founds. $200,000.

**N. J., Springfield**—City plans by L. W. Dennis, 333 North Broad St., Elizabeth, and F. A. Elsasser, 100 Stuyvesant Ave., Union, school. $500,000.

†**N. J., West New York**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by Bowden, Russell & Garland, 13 East 37th St., New York, post office. $342,000.

**N. Y., Great Neck**—Bd. Educ. defeated proposition to construct new wing to high school. $440,000. P.W.A. project. Noted Apr. 5.

**N. Y., Merrick**—Election Sept. 18, for residents of Merrick, North Merrick, Bellmore and North Bellmore for constructing high school to serve the four communities.

†**N. Y., New York** — Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Postal Stations Y and W and Washington Bridge and College Postal Stations. Sites selected.

†**N. Y., New York**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans constructing Postal Station H. Site selected.

†**O., Bellevue** — Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected.

†**Okla., Anadarko**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected. Noted Aug. 2.

†**Okla., Pauls Valley**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans post office. Site selected. Noted Aug. 2.

†**Ore., McMinnville**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected.

†**Ore., Newberg**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected.

†**Pa., Selinsgrove**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected.

**Tex., Austin**—University of Texas, Bd. of Regents, c/o J. W. Calhoun, comptroller, Austin, plans by R. L. White, University Y.M.C.A. Bldg., administration building having two 4 story, stone, hollow tile wings, and 16 story, 60x60 ft., Indiana limestone, brick, steel tower building, University Campus. $1,800,000. P.W.A. allotment approved.

**Tex., Fort Worth**—Public Library Assn., c/o Mrs. C. Scheuber, 9th and Throckmorton Sts., plans 3 story, basement, 132x215 ft., brick, rein.-con library, $650,000. P.W.A. allotment approved. J. R. Pelich, 1103 Trinity Life Bldg., archt.

**Tex., Gladewater**—Bd. Educ. plans by E. G. Eithers Architectural Co., Fort Worth and Gladewater, semi-fireproof high and elementary school building, $200,000. Bonds voted and sold. Noted July 26.

†**Tex., Henderson**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected.

†**Tex., Tegue** — Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected.

†**Vt., St. Albans**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans 3 story, basement, brick, stone, steel, granite, post office and custom house, South Main and Steubens Sts. $250,000. Site selected. Noted Aug. 2.

†**Wis., Kaukauna**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected.

†**Wyo., Gillette**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected.

†**Wyo., Worland**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. Site selected.

**Alta., Edmonton**—Dpt. Justice, Ottawa, Ont., soon takes bids barracks for Royal Canadian Mounted Police, $200,000. W. G. Blakey, archt. Noted Apr. 19.

**B. C., Vancouver**—City calling for competitive designs for city hall on Central School Site, among British Columbia archts as per resolution of City Council. $750,000. Architect not appointed. Noted Jan. 4.

**Ont., Toronto**—Imperial Bank of Canada, 32 Wellington St. E., plans 5 story, basement, 100x100 ft. steel, new head office building, plain found., King and Bay Sts. $1,000,000. Sproatt & Rolph, archts., 1162 Bay St., inviting bids from contractors. Bids will not be called except possibly by successful general contractor for sub-trades. Noted Apr. 9, 1931.

**BIDS ASKED**

†**Calif., La Jolla**—Oct. 12, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $59,400.

†**Calif., Long Beach**—Oct. 15, by Treas. Dpt. at office Sup. Archt., Wash., D. C., finishing 4th to 7th floors of post office building.

†**Calif., Orange**—Oct. 12, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $64,900.

†**Calif., Redondo Beach**—Oct. 12, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $73,700.

**Calif., San Francisco** — Sept. 26, by S. J. Hester, secy. Dpt. P. Wks., City Hall, 3 story, rein.-con. high school, known as George Washington School 30th and 32nd Aves. and Geary and Balboa Sts., for City and San Francisco Co. To exceed $500,000. Miller & Pflueger, 580 Market St., archts. W. L. Huber, 1 Montgomery St., engr. Noted Aug. 9.

†**Conn., Plainville**—Sept. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $58,500. Noted July 25.

†**Del., Reedy Island**—Sept. 27, by Treas. Dpt. at office Sup. Archt., Wash. D. C., remodeling and rehabilitating at U. S. Quarantine Station.

**Ill., Bloomington**—Sept. 29, by Bd. Educ., High School Bldg., for school. $270,000. Schaeffer & Hooton, Peoples Bank Bldg., archts.

†**Ill., Joliet**—Sept. 26, by U. S. Eng., Post Office Bldg., Chicago, furnishing, erecting 1 steel pattern-storage building, at Government Moorings, 830 Railroad St. Noted Aug. 2.

†**Ill., Libertyville**—Sept. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $56,300. Noted Aug. 24.

†**Ill., Morrison**—Sept. 21, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $53,000. Noted Aug. 24.

†**Ill., Villa Park**—Sept. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $70,400. Noted Feb. 3.

†**Kan., Norton**—Sept. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $47,800. Noted Apr. 19.

†**Mass., Boston**—Oct. 5, by Treas. Dpt. at office Sup. Archt., Wash., D. C., superstructure for parcel post building. $3,890,990. Noted Feb. 15, under "Contracts Awarded."

**Mass., Harding**—Sept. 21, by Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, furnishing, installing generating equipment, switchboard and wiring fixtures in connection with power plant addition and alterations at Medfield State Hospital. Former bids rejected. P.W.A. project. W. & L. Eng. Co., 694 Washington St., Boston, engrs. Noted July 12.

**Mass., Waltham** — Sept. 20, by City Purchasing Agent, City Hall, installing sprinkler system at City Infirmary and other miscellaneous alterations.

†**Mich., East Lansing**—Oct. 1, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $60,500.

**Mich., Manistee**—Sept. 18, by L. Bergman, secy. Bd. Educ., 2 story, basement, brick, rein.-con., steel school, plain found. $105,000. P.W.A. project. Robinson & Campau, Michigan Trust Bldg., Grand Rapids, archts.

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Public Buildings (Continued)

†**Minn., International Falls**—Oct. 1, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $84,700.

†**Minn., Walker**—Oct. 12, by Purchasing Agent Dpt. Interior, Wash., D. C., building and garage at Ah Gwah Ching State Sanatorium.

†**Mo., Cameron**—Oct. 1, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $40,000. Noted June 7.

†**Mo., Kansas City**—Oct. 2, by Treas. Dpt. at office Sup. Archt., Wash., D. C., miscellaneous changes at U. S. Post Office.

†**Mo., Perryville**—Sept. 19, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, $37,700 appropriated. Noted May 4, 1933.

†**Montana**—Sept. 21, by U. S. Eng., Kansas City, Mo., constructing camp buildings, Group 4, at Fort Peck Dam site.

†**N. J., Bergenfield**—Sept. 26, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $58,500. Noted Nov. 17, 1932.

†**N. Y., Cobleskill**—Sept. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $52,750.

†**N. Y., Covington**—Sept. 21, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing residence at inspection station.

**N. Y., Endicott**—Sept. 18, by School Bd., constructing G. A. Nichols School. $380,000. A. T. Lacey & Son, 52 Exchange St., Binghamton, archts. Noted Sept. 6.

†**N. Y., Fort Covington**—Sept. 21, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing residences for custom and immigration inspectors at U. S. Inspection Station.

†**N. Y., New York**—Sept. 18, by Treas. Dpt. at office Sup. Archt., Wash., D. C., miscellaneous betterments at Sub-treasury Building, Wall and Pine Sts.

†**N. Y., Watkins Glen**—Sept. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $55,275. Noted Mar. 9, 1933.

†**N. D., Oakes**—Oct. 1, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $49,000.

†**O., Celina**—Sept. 24, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $66,000.

**O., East Cleveland**—Sept. 20, by G. S. Rider Co., archts., Marshall Bldg., Cleveland, furnishing, installing kitchen equipment, sterilizing equipment, laundry equipment, lighting fixtures, domestic refrigerators, mortuary refrigerator and laboratory equipment, driveways, walks, drainage and lawn sprinklers, yard lighting, landscaping, etc. for Huron Road Hospital. P.W.A. project.

†**O., Port Clinton**—Sept. 21, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $58,900.

†**Ore., Hillsboro**—Oct. 9, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $56,700.

†**Ore., Hood River**—Sept. 23, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $61,600.

†**Pa., Ebensburg**—Sept. 21, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $45,540.

†**Pa., Kane**—Sept. 21, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $72,500.

†**Pa., Millersburg**—Sept. 26, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $53,885.

†**R. I., East Greenwich**—Sept. 19, by Treas. Dpt. at office Sup. Archt., Wash., D. C., completing construction U. S. Post Office.

†**S. D., Rapid City**—Sept. 26, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing, extending and remodeling U. S. Post Office.

**Tenn., Memphis**—Oct. 9, at office D. C. Miller, city clk., Court House, John Gaston Hospital, P.W.A. Docket 4983, Madison and North Dunlap Sts. W. F. Schulz, 870 Shrine Bldg., archt. Noted July 26.

**Tex., Brownsville**—See "Contracts Awarded."

†**Tex., Colorado**—Sept. 24, by Treas. Dpt. at office Sup. Archt., Wash., D. C., completing construction of U. S. Post Office. $44,000. Noted Mar. 9, 1933.

†**Tex., Dallas**—Oct. 1, by Treas. Dpt. at office Sup. Archt., Wash., D. C., foundations for parcel post building. Noted Feb. 23, 1934.

†**Tex., Luling**—Sept. 25, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $55,000.

†**Vt., Higate Springs**—Sept. 26, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing inspection station. $75,000. Noted Dec. 12, 1932.

†**Va., Quantico**—Sept. 19, by Yards & Docks, Navy Dpt., Wash., D. C., 2 portable return-flue firebox boilers with accessories, smoke breeching, guyed steel stack and supporting structure for stack and breeching at Marine Barracks, Spec. 7780.

†**W. Va., Montgomery**—Sept. 25, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $50,700.

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## CONTRACTS AWARDED

†**Ala., Mobile** — Treas. Dpt. at office Sup. Archt., Wash., D. C., general contract court house, to Foster & Creighton Co., Amer. Natl. Bank Bldg., Nashville, Tenn. $363,100. Bids Aug. 28. Noted Aug. 16.

†**Ariz., Yuma** — Treas. Dpt. at office Sup. Archt., Wash., D. C., air conditioning U. S. Post Office, to Carrier Eng. Corp., Washington Bldg., Wash., D. C. $18,280. Bids Aug. 24. Noted Aug. 16.

**Calif., Hermosa Beach**—South School Hermosa Beach, reconstructing South and North Schools, involving stripping 4 in. of brick from exterior of building and reinforcing with gunite, placing horizontal steel trusses above the ceiling and rein. roofs, to Johnson & Hansen, 2115 Locust Ave., Long Beach, $8,089 and $9,066 respectively. **P.W.A.** Noted Sept. 28, 1933.

**Calif., Pasadena**—Pasadena Bd. Educ., repairing, rehabilitating 2 and part 3 story administration building containing offices, classrooms and cafeteria, at Woodrow Wilson High School, site, to A. Sordal, 722 Magnolia Ave., Long Beach, $163,327. W. H. Austin, 532 Chestnut Ave., Long Beach, archt.

†**Calif., San Francisco** — Con. Q.M., Fort Mason, office additions to Building 19, Fort Mason, to H. W. Oser & W. C. Akard, Hobart Bldg., $7,444. Bids Aug. 16 awarded Aug. 30.

†**Calif., San Francisco**—Con. Q.M., single attendants' quarters and mess hall at U. S. Quarantine Station, to F. J. Early, 369 Pine St., $25,850. Bids Aug. 14. Noted July 26.

†**Calif., San Francisco**—Con. Q.M., Fort Mason, repairing boiler furnaces, pumps, burners at Letterman General Hospital, to G. E. Kahni Co., 460 9th St., $3,090. Awarded Aug. 28.

**D. C., Wash.**—District Comrs., District Bldg., constructing Anacostia School, to Chas. H. Tompkins Co., 1608 K St. N.W., $388,010. Bids Aug. 31.

†**D. C., Wash.**—National Park Service, steam distribution system in Mall, to S. E. Dockstader, Munsey Bldg., $26,740, Bids Aug. 25***electric ice coolers in Old Post Office Building, to Frigidaire Corp., 1401 41st St. N.W., $4,096, Bids July 27***air conditioning message center, Munitions Building and in Room 3143, Interior Building, to York Ice Mchy. Co., 1238 North 44th St. Phila., Pa., $6,379 and $1,480 respectively, Bids July 28 and Aug. 2 respectively. Grand total $38,695.

†**Illinois**—Twenty-First Forestry Dist., Jefferson Barracks, Mo., general contract kitchen mess building, bathhouse, 2 latrines, 1 headquarters and 6 barracks buildings, 1 first-aid building, office, and quarters, pump and power house, warehouse, garage, at Camp Point, to Olson & Christianson, 7550 Halstead St., Chicago, $23,800. Bids Aug. 20.

†**Illinois**—Twenty-First Forestry Dist., Jefferson Barracks, Mo., 1 kitchen and mess building, bathhouse, 2 latrines, 1 headquarters building, 6 barracks buildings, 1 first-aid building, garage, pump and power house, forestry office, quarters and warehouse at Camp Macomb, to I. Odell, Winnetka, $21,325***same kind buildings at Camp Carrollton, Greenfield, to R. E. Jones, Springfield, $20,726. Bids Aug. 20.

**Ill., Chicago**—Sanitary Dist. of Chicago, power equipment for Lockport Power House, Div. A, to G. Morgan Smith Co., 20 North Wacker Dr., $133,490*** Div. B, to James Leffel & Co., 20 North Wacker Dr., $24,514***Div. C, to Allis Chalmers Mfg. Co., 20 North Wacker Dr., $185,740. Grand total $343,744. **P.W.A.** Bids Aug. 7. Noted July 26.

†**Ill., Decatur**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to W. MacDonald Constr. Co., Syndicate Trust Bldg., St. Louis, Mo., $265,774. Bids Aug. 16. Noted Aug. 9.

**Ill., St. Charles**—Dpt. P. Wks. & Buildings, Div. Architecture, Springfield, boiler setting, breeching, piping, etc., at St. Charles School for Boys, to Northwestern Heating & Plumbing Co., 1465 Sherman Ave., Evanston, $5,705. Bids July 31, awarded Aug. 16.

**Ind., Columbia City**—See "Bids Asked."

†**Ia., Winterset**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to E. Rokahr & Sons, 1815 Y St., Lincoln, Neb. $38,712. Bids Aug. 21. Noted Aug. 9.

†**Ky., Louisville**—Farm Credit Administration, general contract remodeling hotel into office building to house Farm Administration offices, East Bway., to A. Bornstein, 1219 Logan St. ***plumbing, to Gray & Tomppert Co., 840 East Chestnut St.***heating, to G. F. Vogt, 322 West Front St., Jeffersonville Ind.***elevators, to Otis Elevator Co., 653 South 2nd St. Est. $234,000. Noted July 16 Daily.

**Md., Baltimore**—State, M. A. Rackord, c/o National Guard, heating system, in 5th Regiment, to Baltimore Heating Corp., 2000 West Pratt St.; plumbing system, to H. E. Crook Co., 25 Light St. Noted Aug. 23.

†**Md., Baltimore**—National Park Service, Navy Bldg., Wash., D. C., repairing buildings, etc., at Fort McHenry, to J. G. Bensel, 4235 Old Frederick Rd., $17,258. Bids Aug. 6.

†**Md., Beltsville**—U. S. Experiment Farm, Dpt. Agriculture, 2 laboratory buildings, 4 green houses, 2 mushroom houses, etc., to Northeastern Constr. Co., 6 West Madison Ave., Baltimore, $109,480. Bids July 27. Noted July 19.

**Mass., Dorchester**—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, constructing boiler settings at Central Power Plant, Boston State Hospital, to Rust Eng. Co., Koppers Bldg., Pittsburgh, Pa., $2[illegible]077. **P.W.A.** Bids Aug. 28, awarded Aug. 31.

**Mass., Foxboro**—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, furnishing, installing oil burning system at State Hospital, to Hammel Oil Burning Equipment, 409 Pine St., Providence, R. I., $11,595. **P.W.A.** Bids Aug. 10, awarded Aug. 31.

**Mass., Rutland**—Commonwealth of Massachusetts, Dpt. P. Health, State House, Boston, installing sprinkler system in various buildings at State Sanatorium, to Rockwood Sprinkler Co., 120 Milk St., Boston, $2,520. Bids Aug. 15, awarded Aug. 30. Noted Aug. 16, under "Waterworks."

†**Michigan**—Dpt. Commerce, Light House Dpt., constructing lighthouse structure on Grays Reef, incl. preparation of site, constructing concrete foundation crib and sinking it at site, and concrete superstructure, to Greiling Bros., Green Bay, Wis., $108,587.

**Minn., Hibbing**—Village, general contract 2 story, basement, 302x322 ft. memorial building to H. L. Stavn, Hibbing, $317,500*** heating, plumbing and ventilating, to Mechanical Constr. Corp., Hibbing, $59,782***electrical wiring, to Commonwealth Electric Co., 417 Bway., St. Paul, $21,642. Grand total $398,925. **P.W.A.** Bids Aug. 23.

†**Minn., Hopkins**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to Bracker Constr. Co., 60 Natl. Bldg., Minneapolis, $31,749. Bids Aug. 29 Noted Aug. 9.

**Mo., Hannibal**—City, c/o W. S. Watson, supt. Bd. P. Wks., City Hall, light and power plant improvements, one 7,500 kw. steam turbine generator, to Westinghouse Electric & Mfg. Co., 411 North 7th St., St. Louis, $161,290; 10,700 sq.ft. surface condenser with auxiliaries, to Elliott Co., Railway Exch. Bldg., St. Louis, $35,909. Est. $270,000. **P.W.A.** Baumes & McDevitt Co., Railway Exch. Bldg., St. Louis, engrs. Bids Aug. 27.

**Mo., Independence**—City, to Westinghouse Electric & Mfg. Co., 2124 Wyandotte St., Kansas City, 3,000 kw. turbo-generator at municipal light and power plant $65,966; 5,000 sq.ft. surface condenser $18,035***to C. H. Carr & Co., Kansas City, automatic self-cleaning air filter, $810. **P.W.A.** Black & Veatch, 700 Mutual Bldg., Kansas City, engrs. Bids Aug. 21.

†**Mo., Neosho**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to Murch Bros. Constr. Co., Railway Exch. Bldg., St. Louis, $34,411. Bids Aug. 28. Noted Aug. 9.

†**Mo., St. Joseph**—Treas. Dpt. at office Sup. Archt., Wash., D. C., heating system in U. S. Post Office, to Gary Plumbing & Heating Co., Gary, Ind., $17,480. Bids July 5. Noted June 21.

**N. J., Greystone Park**—Dpt. Institutions & Agencies, State House, Trenton, heating, ventilating equipment, heaters, heating specialties, etc., for 2 tiers New Jersey State Hospital, to B. F. Sturtevant, Crestmont Ave., Camden, $2,885. Bids Aug. 29, awarded Aug. 30.

**N. Y., Buffalo**—Bd. Educ., general contract Kensington High School, Suffolk St., to R. E. Williams & Sons, Groat St., Buffalo, $745,777. **P.W.A.** Bids Aug. 14. Noted July 19.

†**N. C., Asheboro**—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office, to Murch Bros. Constr. Co., Railway Exch. Bldg., St. Louis, Mo., $38,475. Bids Aug. 17. Noted Aug. 9.

**N. C., Wentworth**—Bd. Educ. Rockingham Co., J. E. McLean, secy. (a) constructing (b) heating (c) plumbing, (1) additions to Colored School at Reidsville (2) North End School 2 (3) South End School 2 (4) Huntsville School 3 (5) Williamsburg School 5 (6) North Spray School 10 (7) Leaksville Grade School 11 (8) Madison School 1 (9) Madison School 2 (10) Burton Grove School 12 (11) Draper School 13 (12) Lakeside School 14, to Angle-Blackford Co., Greensboro, (a1) $14,694 (a8) $17,444 (a9) $6,990***to Southeastern Constr. Co., 218 West 2nd St., Charlotte, (a2) $36,590 (a3) $36,784 (a6) $8,546 (a7) $15,648*** to Lamb & Lewallen, Asheboro, (a4) $30,485 (a5) $30,485*** to Geo. W. Kane, Greensboro, (a10) $9,991 (a11) $5,971 (a12) $8,838*** to Reliance Eng. Co., Charlotte, (b1) $4,783 (b4) $3,234 (b5) $3,234***to J. L. Powers, Bennettsville, (c1) $1,640 (b2) $3,365 (c2) $2,795 (b3) $3,365 (c3) $2,765 (c4) $2,830 (c5) $2,830 (b6) $1,760 (b7) $990 (b11) $695 ***to Tompkins-Johnston Co., 106 North Brevard St., Charlotte, (b8) $992 (b9) $578*** to Davis Plumbing & Heating Co., Lexington, (b10) $493 (b12) 586***to Crutchfield-Sullivan Co., Greensboro, (c8) $1,660 (c9) $880. Grand total $295,266. Bids Aug. 28. Noted Aug. 23.

†**O., Berea**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to J. C. Miller, Campbellsville, Ky., $35,552. Bids Aug. 28. Noted Aug. 9.

†**O., Circleville**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to Garland Co., 58 East Washington Ave., Chicago, Ill., $38,883. Bids Aug. 15. Noted Aug. 2.

†*Federal Government.*

Public Buildings (Continued)

**Okla., Clinton**—School Bd., general contract 2 story high school, to S. S. Langhlin, 1429 East 23rd St., Oklahoma City, $109,525. Bids Aug. 14. Noted Aug. 9.

**Pa., Bradford**—Bd. Educ., J. B. Butterworth, supt., general contract elementary schools in 3rd, 2nd and 6th Wards, to Havens & Coughlin, Olean, N. Y., $380,390***plumbing, to Wm. M. Clark Co., New Castle***heating, to H. Dougherty, Freeport***electrical work, to Hale Electric Co., 6202 Penn Ave., Pittsburgh. Est. $600,000. Lawrie & Green, 3rd and Forster Sts., Harrisburg, archts. F. Fensel, Hooker Fulton Bldg., associate archt.

**Pa., Reading**—Reading School Dist., 8th and Washington Sts., for Amanda Stoudt Grade School, 2 story, basement, 60x208 ft., and 100x160 ft., brick, steel, rein.-con., plain found., to Consolidated Eng. Corp., 20 East Franklin St., Baltimore, Md., $350,000. Bids Aug. 14, awarded Aug. 27. Noted Aug. 2.

†**S. C., Paris Island**—Yards & Docks, Navy Dpt., Wash., D. C., reroofing buildings at U. S. Marine Barracks, to G. A. Shillito, Columbia, $11,000. Bids Aug. 25.

**Tex., Brownsville**—City, c/o R. B. Renfro, mayor, municipal improvements, incl. 2 steel forced draft stacks for boilers, steel truss, concrete deck roof over generating room at municipal power plant and extension plant, water pumping plant complete, with 1 each of 12 in., 16 in., and 20 in. motor driven pumps with clutched drive to gasoline engine for 16 in. pump, concrete and galv. iron pump house, 3,400 ft. concrete lined canal and earth reservoir approximately 50,000 cu.yd. earth excav., transmission line equipment, spray pond equipment, generator and boiler room instruments and equipment, day labor. Former bids rejected. H. E. Elrod, 316 Petroleum Bldg., Houston, engr. **P.W.A.** Noted Sept. 6.

†**Wis., Portage**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to J. P. Cullen & Son, Jamesville, $33,286. Bids Aug. 24. Noted Aug. 9.

†**T. H., Pearl Harbor**—Yards & Docks, Navy Dpt., Wash., D. C., ceiling for storehouse extension, Spec. 7700, to J. B. Eurrell Co., 225 South 15th St., Phila., Pa., $11,200. Bids Aug. 29. Noted July 19.

**Ont., Ottawa**—Dpt. P. Wks., Ottawa, replacing all present hot water piping in sub-basement of Parliament Buildings, supply new brass valves, new hot water tanks, etc., to W. G. Edge Ltd., Gloucester St., $9,450. Awarded Aug. 30.

**Ont., Toronto**—J. Wilde Ltd., general contractors, 10 Dunklin St., electric wiring in new 14 story addition to Western Hospital, to Canada Electric Co., 175 King St. W., for Western Hospital Bd., Bathurst St. Noted July 12, under "Contracts Awarded."

## COMMERCIAL BUILDINGS

### PROPOSED WORK

**Mass., Boston**—Shepard & Stearns, archts., 65 Franklin St., soon lets contract 7 story, basement, 40x80 ft, brick, structural steel fur store and storage, concrete found., Washington St., for I. J. Fox, Inc., 403 Washington St. To exceed $150,000. E. Rothschild & Co. Inc., 580 5th Ave., New York, assoc. archt. Noted June 28.

**N. Y., Brooklyn**—G. V. McPherson, 2047 Nostrand Ave., plans by G. G. Miller, 10 West 47th St., New York, 6 story, 82x200 ft. apartment, 51 West 15th St. $125,000.

**N. Y., New York**—One Hundred Twenty East 89th Street, Inc., c/o I. Margon, archt., 220 East 42nd St., plans 6 story stores and apartment, 231 Lexington Ave. $250,000.

**N. Y., New York**—Public National Bank, 76 Williams St., plans by Schwartz & Gross, 347 5th Ave., 3 story, basement, brick bank, 102 Orchard St. $200,000.

**N. Y., New York**—S. L. and H. Minskoff, 521 5th Ave., plans 6 story, 100x102 ft., apartment, 405 East 72nd St. $125,000 or more. Site acquired.

**O., Cleveland**—Square Theatre Co., c/o W. N. Skirboll, Film Exch. Bldg., East 21st St. and Payne Ave., sketches 1 story, brick, steel, rein.-con. theater addition, plain found., Shaker Square. $150,000.

**Ont., Toronto**—Sproatt & Rolph, archts, 1162 Bay St., soon lets contract (invitation bids only), 5 story, basement, 100x100 ft., steel, rein.-con. head office building, plain found., King St., for Imperial Bank of Canada, Head Office, 32 Wellington St. E., $1,000,000. Harkness & Hertzberg, 57 Bloor St. E., engrs. H. H. Angus, 1221 Bay St., mechanical engrs.

### BIDS ASKED

**Ind., Indianapolis**—See "Contracts Awarded."

### CONTRACTS AWARDED

**Conn., Fairfield**—Bridgeport Protestant Orphanage, electrical work for cottage group, to W. Rock, 1115 Main St., Bridgeport; reinforcing steel, to Hunter & Havens, 239 Water St., Bridgeport. Noted May 24, under "Contracts Awarded."

**Ind., Gary**—Montgomery Ward & Co., 619 West Chicago Ave., Chicago, Ill., remodeling 3 story, store, incl. new heating system, plumbing, electric fixtures, to Williams & Patch, Gary, $60,000. Noted July 19.

**Ind., Indianapolis**—L. S. Ayres & Co., 1 West Washington St., remodeling department store, incl. escalators, sprinklers, separate contracts and day labor. Est. $250,000.

**Mo., St. Louis**—St. Joseph's Male Orphanage, c/o Catholic Orphans Bd., Grand Blvd. and Itaska St., general contract 3 story, basement, 32x73x77x184 ft., concrete, brick, stone, hollow tile orphans home, Delor St. west of Grand Blvd., to Mississippi Valley Constr. Co., Wainwright Bldg.***heating, to Heckel Gunn Heating Co., 3685 Olive St.***plumbing, to T. J. Sheehan Co., 2333 Olive St.***electrical work, to J. T. Finley, 5223 Tholozan St. Est. $150,000. H. P. Hess, Ambassador Bldg., archt. L. M. Dieckmeyer, 5923A Maple Ave., engr.

**N. Y., Troy**—St. Augustine Roman Catholic Church, steel church, plain found., to Philip Casey Jr., 337 4th St. Est. $105,000. Awarded about Aug. 25. Noted June 7.

**O., Toledo**—Y.M.C.A., P. B. Williams, secy., constructing new central building, 7 story, brick, terra cotta, tile, etc., to Frank Messer & Sons Co., 2515 Burnet St., Cincinnati, $378,819*** plumbing and heating, to Pioneer Plumbing & Heating Co., 136 West Woodruff St., $65,411 ***electric wiring, to John P. Morrissey Co., 405 Lexington Ave., New York, $27,470*** elevators, to Haughton Elevator & Machine Co., 671 Spencer St. Toledo. $13,276. Grand total $484,976. Bids Aug. 15. Noted Aug. 2.

**Pa., Elizabethtown**—Masonic Home Building Com., Masonic Temple, Phila., 3 story, basement, 50x150 ft., building known as Kuhlemeier Cottage, plain found., on Masonic Grounds, to D. S. Warfel Co., Inc., Anne St. and East End Ave., Lancaster. Bids Aug. 22, awarded Aug. 30. Noted Aug. 23.

## INDUSTRIAL BUILDINGS

### PROPOSED WORK

**Calif., Stockton**—LUMBER TERMINAL—Santa Fe Lumber Co., 16 California St., San Francisco, completing plans 78x500 ft. corrugated iron (shipside) plant for lumber terminal on waterfront, $40,000. Private plans.

**Calif., Ukiah**—WINERY—C. D. Tribuno plans rebuilding winery, recently destroyed by fire. $40,000 with equipment.

**Calif., Vallejo**—FLOUR ELEVATOR—Sperry Flour Co., 4th and Berry Sts., San Francisco, plans rebuilding 100 ft. marine elevator, South Vallejo Dist. $250,000 fire loss.

**Calif., Visalia**—BAKING PLANT—Visalia Baking Co., North 2nd Ave., plans rebuilding brick or rein.-con. baking plant, to replace plant destroyed by fire, North 2nd St. Fire loss exceeds $100,000.

**Conn., Bridgeport** — FACTORY — Bridgeport Brass Co., 774 East Main St., postponed construction 1 story, 55x130 ft. brick, steel factory unit. To exceed $28,500 Fletcher-Thompson, Inc., 1336 Fairfield Ave., archts. Noted May 24.

**Conn., Greenwich**—WAREHOUSE—Electrolux, Inc., 500 5th Ave., New York, soon lets contract 2 story, 85x135x135 ft., brick, steel, Old Greenwich. To exceed $28,500. H. K. Ferguson Co., Hanna Bldg., Cleveland, O., archts.

**Fla., Pensacola** — BREWERY — Spearman Brewing Co., L St. and Barrancus Ave., plans by R. Griesser, archt. and engr., 54 West Randolph St., Chicago, Ill., brewery. $200,000.

**Ind., Austin**—POWER SUB-STATION, etc.—Public Serv. Co., Traction Bldg., Indianapolis, making plans power sub station, transmission and distribution lines. $60,000. Private plans.

**Me., Lovell**—GARAGE, etc.—Browns Camps on Lake Kezar plans garage, camps, service station, etc. $45,000. Architect not appointed.

**Md., Baltimore**—BREWERY—Globe Brewery, 328 South Hanover St., soon lets contract 3 story, 20x60 ft. brewery addition, H. C. Aiken, Baltimore, archt.

**Mass., Dorchester**—MARKET, etc.—Superior Realty Co., 600 Columbia Rd., plans by W. M. Bacon, 530 Gallivan Blvd., 2 story, basement, 100x155 ft., brick market and storage, concrete found., Gallivan Blvd. To exceed $40,000.

**Mass., Lawrence**—GARAGE—Nevins Auto Co., 400 Bway., postponed construction of 1 story, basement, 70x140 ft. garage addition, Bway. J. G. Morissette, 575 A Essex St., archt. Noted June 21.

**Mass., South Braintree**—MANUFACTURING PLANT—Braintree Rubber Cement Co., G. S. Reynolds, mgr., plans rebuilding manufacturing plant, destroyed by fire. Private plans. Awaiting fire insurance adjustment.

**N. J., Teaneck**—MARKET—Agent, c/o Bergen, Inc., 31 Main St., Hackensack, plans by B. F. McGuire, 705 Linden Ave., 3 story, basement, 105x160 ft. brick, steel market, plain found. $200,000

**N. Y., New York**—STORAGE and DISTRIBUTION—Daniel Reeves, Inc., 44 West 143rd St., plans by Scacchetti & Siegel, 1260 Bway., 3 story, basement, 32x199 ft. storage and distribution, 43 West 142nd St. $50,000.

**O., Cincinnati**—POWER HOUSE—Cliffside Brewing Co., 242 West McMicken St., plans by Fosdick & Hilmer, power house addition, $30,000 or more.

**Pa., Pittsburgh** — PLANT — McCormick Co., archts., 121 South Negley Ave., soon lets contract 3 story, basement, 60x120 ft., concrete, brick, and one 3 story, basement, 92x115 ft., rein.-con. buildings for ice cream plant, Denniston and Aurelia Sts., for Medaow Gold Dairies, Inc., Denniston and Aurelia Sts.

**Tenn., Cleveland**—GASOLINE STATION—G. Johnson, plans by M. Mabey, Rossville, 1 story, brick, concrete, rein.-con. gasoline filling station, incl. rest rooms, etc., Ocoll St. $40,000.

**Tex., Longview**—BOTTLING PLANT—Coca Cola Bottling Co., B. F. Martin, J. Sunger, Longview, making plans 2 story, 50x100 ft., brick, rein.-con., semi-fireproof bottling plant, plain found. Architect, c/o owners, archt.

**Wash., Chewelah**—PLANT—E. E. Farnell Lumber Co. plans plant. $50,000.

**W. Va., New Cumberland**—PLANT—Cronin China Co., c/o D. Cronin, New Cumberland, plans reconditioning plant. $30,000 or more.

**Wis., La Crosse** — BOTTLING PLANT — G. Kunz Brewing Co. plans bottling plant. $28,000 or more.

**Ont., Fossmill**—MILLS—Fassett Lumber Co., plans rebuilding lumber and lath mill units completely destroyed by fire. $150,000 fire loss. Interested in prices complete equipment.

**Ont., Kitchener**—PLANT—Bradkin & Thornell Ltd. plans plant for manufacture of boots and shoes. $40,000.

**Que., Noranda**—HYDRO-ELECTRIC PLANT—Noranda Mines, Ltd., Royal Bank Bldg., Toronto, Ont., has been incorporated to report and if satisfactory to proceed with construction and development of 20,000 hp. power development on Upper Ottawa River for use of Noranda Mines. F. A. Gaby, 480 Spadina Rd., Toronto, Ont., consult. engr. Noted Aug. 23.

**Sask., North Battleford**—GRAIN ELEVATOR—Saskatchewan Elevator Co. plans grain elevator. $35,000.

### BIDS ASKED

**Mass., Worcester**—BULK STORAGE PLANT—See "Contracts Awarded."

**N. J., Flemington**—BULK PLANT—Standard Oil Co. of New Jersey, 26 Bway., taking bids separate contracts bulk plant. $40,000 or more.

### CONTRACTS AWARDED

**Conn., New Haven**—PLANT—New York, New Haven & Hartford R.R., E. E. Oviatt, ch. engr., structural steel for 1 story, brick, steel boiler plant at Cedar Hill terminal, to N. E. Iron Wks. Co., 1351 Dixwell Ave.***steel stacks, to Bigelow Co., 92 River St.***boiler parts, to Babcock & Wilcox Co., 49 Federal St., Boston, Mass. Noted Aug. 2, under "Contracts Awarded."

**Ky., Lexington**—STORAGE, etc.—Jas. E. Pepper Distillery, rebuilding storage and cooperage shop, to A. J. Lubrecht, Covington. To exceed $100,000.

**Ky., Lexington**—WAREHOUSE—Schenley Distillers, c/o James E. Pepper & Co., brick, concrete bonded warehouse building, 20 West 40th St., to A. J. Lubrecht, South Fort Mitchell. Noted Aug. 23.

**Mass., Worcester**—BULK STORAGE PLANT—L. Goldberg, c/o Harry L. Meacham Associates, archts., 120 Front St., 1 story, 22x24 ft., office and service building, paving, pumps, greasing and spraying pits, two 15,000 gal., three 10,000 gal. and three 1,500 gal. tanks for gasoline storage, two 15,000 gal. tanks for fuel oil storage, Southbridge St., day labor. To exceed $30,000. Noted July 12.

**Mich., Elsie**—REFINERY—Maxwell and R. Lewis, Ovid, 1,000 to 1,500 bbl. capacity oil refinery, day labor under supervision of E. G. Guy, engr., c/o owners. Est. $60,000 or more. Noted Aug. 23.

**Minn., Mankato** — FACTORY — Northwest Hemp Corp., 2 story, 40x75 ft. factory, Mound Ave., separate contracts awarded, $30,000 or more.

**N. J., Perth Amboy**—METAL TREATMENT PLANT—Raritan Copper Wks., G. Evans, in charge, 25 Bway., New York, metal treatment plant addition, separate contracts awarded. To exceed $28,000.

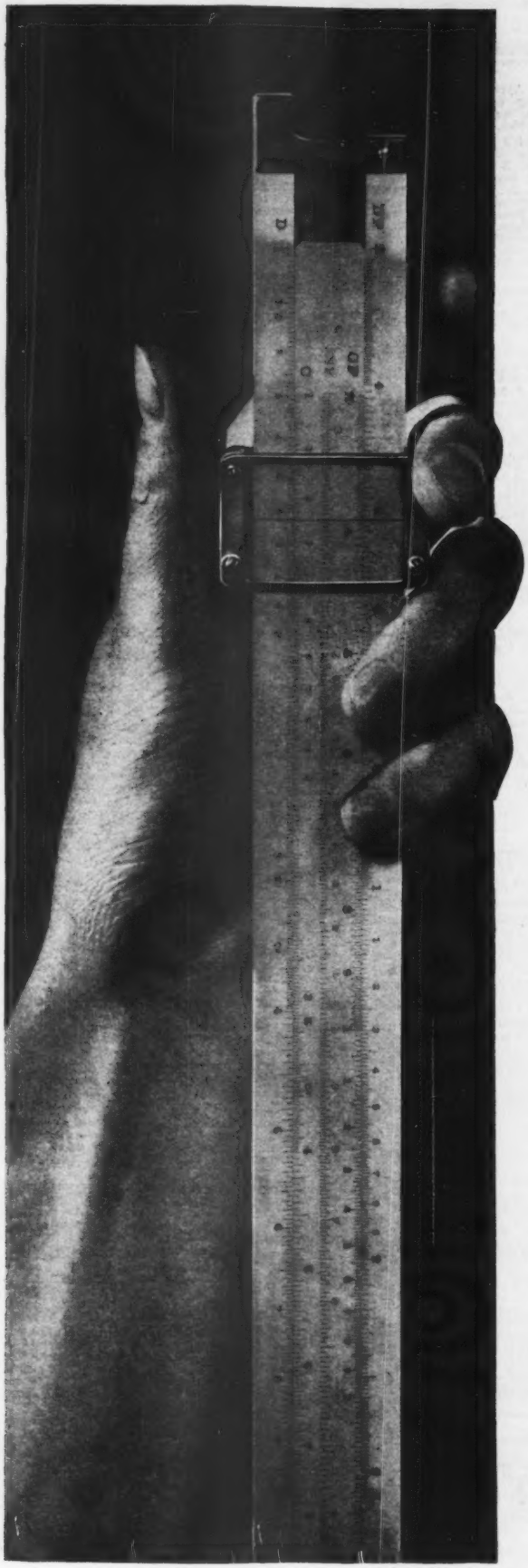
**N. Y., Elmira**—WAREHOUSE—Swift & Co., Union Stockyards, Chicago, Ill., general contract brick, plain found., to Austin Co., 1611 Euclid Ave., Cleveland, O., approximately $75,000. Awarded about Sept. 1. A. E. Bump, c/o Swift & Co., 25 Faneuil Hall, Boston, Mass., engr.

**Pa., Bradford**—GARAGE, etc.—Pringle Powder Co., general contract garage and storage building, to E. L. Sickle, Hooker Fulton Bldg.***heating, to Bradford Oil Burner Co., Bradford***plumbing, to W. H. McQuillin, Bradford***electrical work, to Booth Electrical Co., Bradford. Noted Aug. 2.

**Pa., Warren**—DISTILLERY—Middleton Distilling Corp., distillery at former Ward Baking Co. yeast plant, 3 concrete silos with grain capacity of 21,000 bu. and warehouse with capacity of 20,000 bbls. and 23,000 cases of liquor, to Heller Bros. Co., Thurman and Furnace Sts. (tentative award.) Private plans.

**Vt., Rutland** — WAREHOUSE, etc. — S. S. Kresge Co., 2727 2nd Blvd., Detroit, Mich., T. B. Murphy, constr. superv., 1 and 2 story, basement, 40x130 ft. warehouse and store, Merchants Row, to R. E. Runels Constr. Co., 24 Merrimack St., Lowell, Mass. Private plans.

†*Federal Government.*



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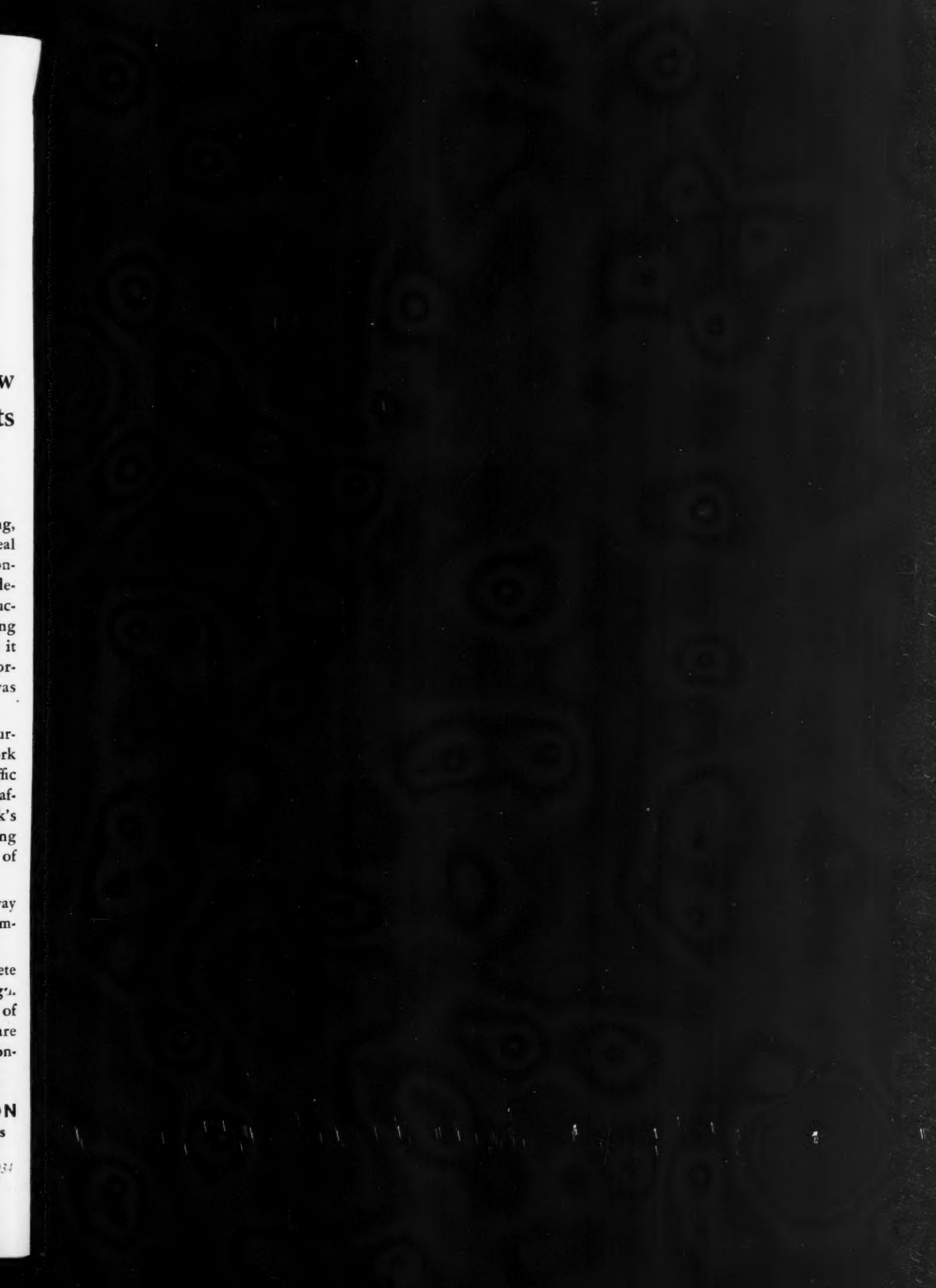
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